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A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION.
ISSUED WEEKLY BY THE AMERICAN MACHINIST PRESS,
Vol. 22. 218 WILLIAM STREET, NEW YORK. No. 43.

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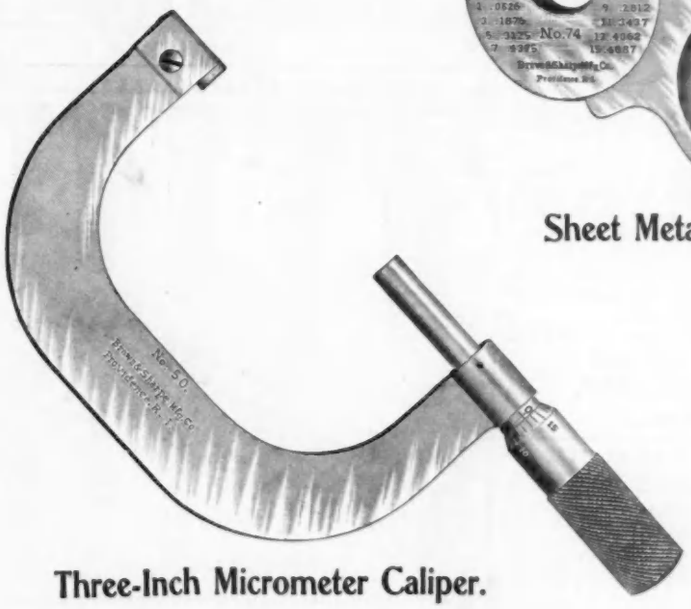
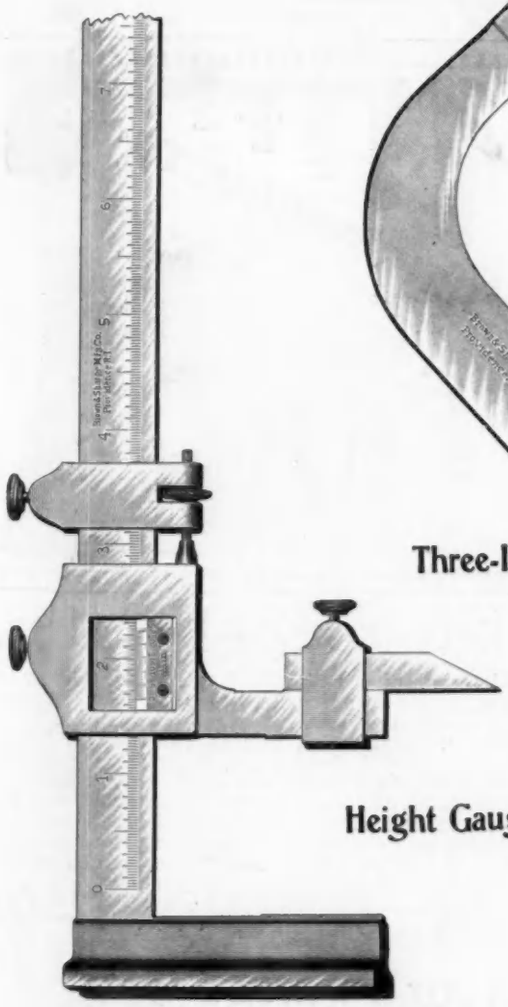
PROVIDENCE, R. I., U. S. A.

New Tools ...

Sheet Metal Gauge.



Three-Inch Micrometer Caliper.



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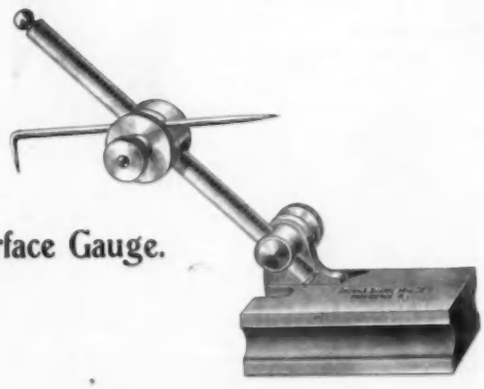

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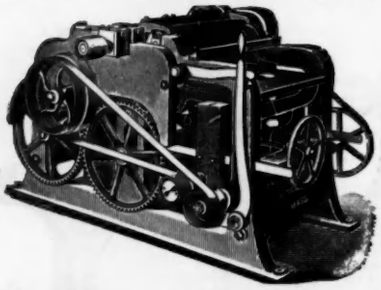

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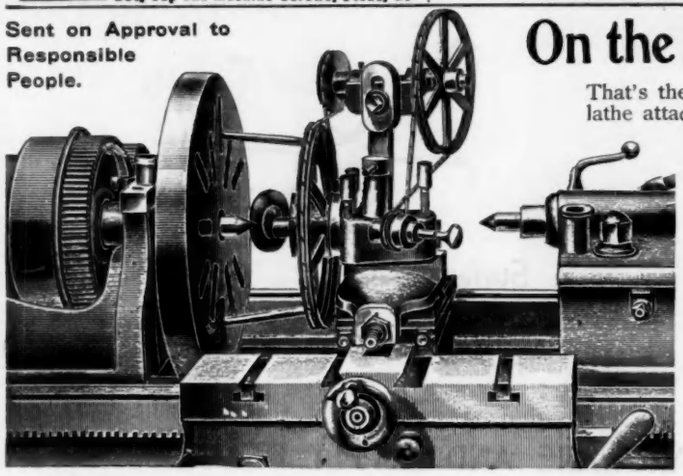

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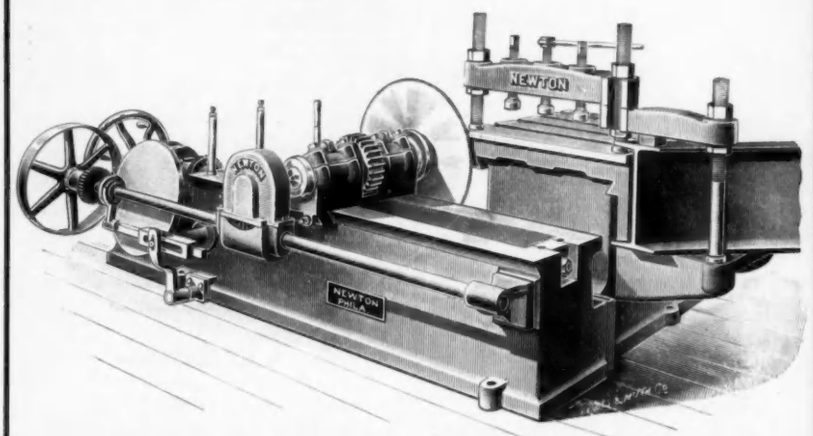

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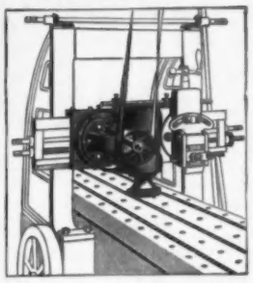

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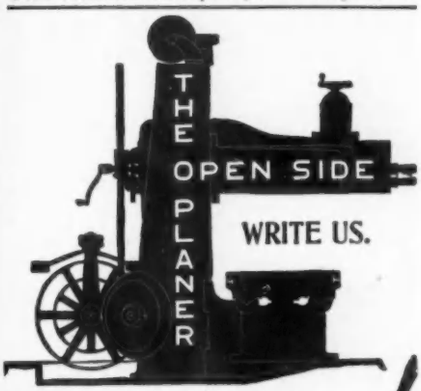

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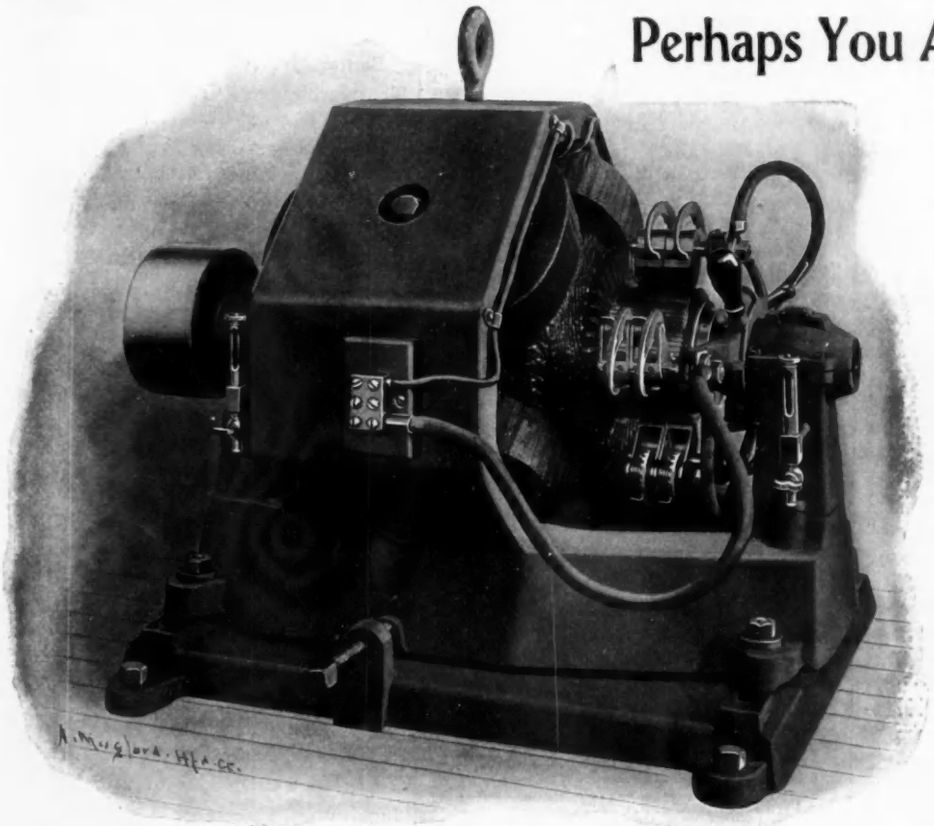

Perhaps You Are Wondering

whether you need electric power in your shop—whether the savings it would effect would repay the investment, and just what would be gained by its installation.

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AMERICAN MACHINIST

A PRACTICAL JOURNAL OF MACHINE CONSTRUCTION

VOLUME 22 NEW YORK, THURSDAY, OCTOBER 26, 1899 NUMBER 43

Published at 218 William St., New York,
Every Thursday by the

American Machinist Press.

[INCORPORATED.]

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A. LEIGHTON DONNELL, Sec'y.

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Address all business communications to the American Machinist Press. Matter for reading columns may be addressed to the Editor.

Subscribers can have address changed at will. Give old and new addresses. Date on wrapper denotes end of month in which subscription expires.

Subscription Price:

$3 per year in advance, postage paid, in North America.
$4 per year in foreign countries, postage prepaid.
No back numbers beyond current year.
For sale by newsdealers, generally.

CHAS. CHURCHILL & CO.,
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Representative for France, Belgium, Switzerland and Italy.

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Representative for Denmark, Norway and Sweden.

Entered at New York P. O. as second-class mail matter.

Cable address, "MACHINIST," N. Y.
Lieber's and A B C Codes.

Modern Industrial Expositions.

Upon visiting any one of the formal exhibitions of the processes and products of our national industries in recent years, such, for instance, as the Export Exposition at Philadelphia, it is not easy to repress a certain feeling of disappointment. The exhibition must in each case have some excuse for its being, and its ostensible promise is to show us things novel, interesting and instructive. We go to see and we go to learn; and when we are there we find little that seems to need the looking at, and we come away with little consciousness of any access of knowledge. There is, perhaps, no remark more common than that which is usually made by the older visitors, that these exhibitions are not what they used to be, meaning that they have not to the visitor the interest that the industrial exhibitions of the olden time, as now remembered, seemed to possess. We hear less than in justice we should hear of the change which has come over the visitor to the exhibition. The source of his disappointment is in himself more than in the exhibition. He is a victim of the modern machinery of enlightenment. These occasional exhibitions are not so striking because of the permanent expositions which are maintained, and which force the various novelties upon his attention and familiarize him with them in spite of himself, and long before he has the opportunity to attend the show. Our own journal, and various others, are perpetual exhibitors of the latest and best in our respective lines. What chance would any constant reader of the "American Machinist" have of being astonished by anything that could be shown him, say, in the line of machine tools at such an exhibition? In the middle of the main building at Philadelphia is the magnificent exhibit of the Pencoyd Iron Works, a conscientious and thorough showing of the processes and products of their works, and fine samples of details of bridge and building construction, but it would be difficult to say that any engineer of standing who visited and admired the collection would there receive his first information concerning any part of it. So in the transportation building may be seen two or three fine locomotives, a couple of steel freight cars, an improved car for a street railway and two or three large castings for a marine engine. All of these, except the marine engine parts, we have seen over and over again on our way to the show, and all of them, including the castings, we have read about fully in both the daily and the technical press. For the old-time attractiveness of industrial exhibitions what is most of all needed is the visitor who does not already know it all. And yet, with things as they are, the visitors, whom it is almost hopeless to think of directly informing upon any point, are stimulated by these exhibitions as a whole, and they catch on with profit here and there to what interests them. With some it will be one thing, and with some it will be another, the suggestiveness and stimulus of which will abide and continue to work long after. We have to confess that to us the fine models of several of the U. S. warships and of our merchant marine were alone worth going to Philadelphia to see. The remark which they provoke at this distance is as to the absurdly diminutive wheels by which they are propelled and the rudders by which they are steered. While these models are so complete and so delightful to look upon, they suggest the extreme desirability of a view of the interior, which is not given. We hope yet to see these models split vertically down the middle and showing all of the inside as well as the outside, the decks and bulkheads, the arrangement of the cabins and passages, the boilers and engines, the turret operating and the steering machinery, and all the auxiliary mechanism. We can read of all these things and pore over the drawings of them, but five minutes with one of these splendid models is worth five weeks with the labored description of the books, and this is the kind of thing that is practically and profitably realized at these expositions. The show at Philadelphia is called an *export* exposition, and in fact it is just as much an export exposition as any other industrial exhibition is. It shows the best of American products as made for Americans, and these are the best also for all the world, and the habits and the wants of all the world are becoming assimilated to them.

Maintain and Extend Foreign Trade.

We are glad to observe a decided tendency among our machine builders to agree with the "American Machinist" on the point of the importance of retaining a hold upon the foreign business that has been built up. It seems to be generally perceived that a time may come, before long, perhaps, when, as was the case a few years ago, this foreign business will be the main dependence to keep the wheels turning in American shops. As one builder phrased it, "The foreign trade don't seem to boom and bust like ours."

It is being more clearly perceived, also, that the conservatism which we find abroad, and which sometimes seems aggravating, has its brighter side as well; for when once the barriers have been passed and "connections established," there is a certain stability and a disposition to send repeat orders for machines that have proven satisfactory, rather than try something else, which we do not find so strongly manifested at home. This makes business relatively easy to hold when once gained, and will operate in favor also of any builders who may make inroads upon our trade by reason of long delays in filling orders or for any other reason. We are as firmly convinced as ever that our tool builders, and others who are sending machines abroad, should take special pains to retain, cultivate and extend the foreign trade so auspiciously begun.

Peeping Over the Trade Fences.

Molders, as we have known them, do not excel in active athletics. The editor of "The Foundry," however, displays remarkable agility in jumping over a recent plain statement of ours. Not long ago we spoke of "one of the best and most experienced brass molders in the United States," who has invented an alleged anti-friction device for the submerged surfaces of ships. "The Foundry," notwithstanding our assertion of the status of the inventor referred to, proceeds to say of him: "The truth is he is not half a molder. He is one of those workmen whom it pays nobody to employ," which is enough of it to quote here. Now, the gentleman under discussion is, as a matter of fact, one of the best brass molders, and one of the best brass founders, whom we have ever known. He knows the trade in every detail, up and down and through and through. He has been the responsible, practical head of the foundry with which he is connected for more than a quarter of a century, to our personal knowledge, and so far from being "one whom it pays no one to employ," the foundry under his charge has also been the most constantly and largely profitable business in its line that we have known.

But that is a little matter, if only our esteemed co-worker will please remember that we usually mean just about what we say. We are inclined to more earnestly object to the assumption of "The Foundry" that a man is any the worse as a molder for having some ideas outside of the foundry. It is not probable that our brass molder friend will revolutionize the building of ships, but still some of the most valuable practical improvements have come to all our trades from the outside. The looker-on sees most of the game, and can often suggest a winning play, but what if there were no looking over each other's shoulders, and no seeing of each other's hands? What would the foundry be to-day without the traveling crane, the air hoist and all the other pneumatic appliances, the Tabor and other molding machines? Were all these invented by molders?

A molder may do the very best of work as a molder without having his mind for every waking minute filled with sand and patterns and flasks and molten metal. In fact, he cannot do the best work as a molder without knowing what the other trades are doing, and being stimulated by the pace at which they are going. These modern appliances of which we spoke, and which were not originated by molders, were still profitably adopted by them, and first of all by the molders who could look out of the foundry and see their successful operation elsewhere. The tricks and devices of the best molders have also been appropriated by the enterprising ones in the other trades, and mutual knowledge has been helpful to all.

Besides this, there is a reflex effect upon the worker that is most beneficent. The best accomplishment calls for rest after it, but the rest of inaction is the worst of all. And so we approve generally of hobbies. The best rest of the faculties may come from their employment upon the most diverse and contrasting occupations. If a tired molder cannot conveniently go a fishing, what better than the designing of fishing boats and other craft? In one of our most advanced foundries, where they have continuous casting, there is an endless canal with floats that carry the flasks around from the molder to the cupola and back again. All this did not grow in the mind of the molder who was nothing but a molder, and who could think of nothing but the few primitive tools of the first foundry man.

It has been convenient here to speak only of the molder, but it is easily translatable into the technique of the other trades, and equally applicable elsewhere. "Let the shoemaker stick to his last" is not the key to full success anywhere.

Annual Meeting of the Society of Naval Architects and Marine Engineers.

The seventh annual meeting of the Society of Naval Architects and Marine Engineers will take place on Thursday and Friday, November 16 and 17, in the auditorium of the home of the American Society of Mechanical Engineers, No. 12 West Thirty-first street, this city. The following papers are to be read:

Thursday, November 16, 1899.—"Coaling Vessels at Sea," by Spencer Miller, Esq.; "Causes for the Adoption of Water-Tube Boilers in the United States Navy," by Engineer-in-Chief Geo. W. Melville, U. S. N., vice-president; "Suggestions as to Improved Appliances for Launching Ship's Boats," by John Hyslop, Esq.; "The Electric Plants of the Battleships 'Kearsarge' and 'Kentucky,' by Naval Constructor J. J. Woodward, U. S. N.; "The Increasing Complications in Warships, and How Simpler Arrangements Might Be Adopted," by Geo. W. Dickie, Esq.; "Beam Formulæ Applied to a Vertically Stiffened Bulkhead, with Some Results," by H. F. Norton, Esq.; "Notes on Sheathing the U. S. S. 'Chesapeake,'" by Naval Constructor Lloyd Bankson, U. S. N.

Friday, November 17, 1899.—"System of Work in a Great Lake Shipyard," by W. I. Babcock, Esq.; "Overhead Cranes, Staging and Riveter Carrying Appliances in the Shipyard," by James Dickie, Esq.; "Designs for the Denver Class Sheathed Protected Cruisers," by Chief Constructor Philip Hichborn, U. S. N., vice-president; "Novelties in Ship Fittings," by Assistant Naval Constructor R. M. Watt, U. S. N.; "Progressive Speed Trials of the U. S. S. 'Manning,'" by Prof. C. H. Peabody; "Tactical Considerations Involved in Torpedo-Boat Design," by Lieut. A. P. Niblack, U. S. N.; "On the Action of the Rudder, with Special Reference to the Motion of the Ship While the Helm Is Being Put Over," by Prof. Wm. F. Durand.

Examination for Ship Draftsmen and Assistant Ship Draftsman.

The United States Civil Service Commission announces that on December 5, 6, 7, 8, 1899, examination may be taken in any city in the United States where the Commission has a board of examiners for the grades of Ship Draftsman and Assistant Ship Draftsman, Bureau of Construction and Repair, Navy Department. This examination was scheduled to be held on October 17-20, 1899, but was postponed on account of the small number of applicants.

From the eligibles resulting from this examination certifications will be made to fill the positions of ship draftsman, Newport News, Va.; ship draftsman, Portsmouth, N. H.; ship draftsman, Boston, Mass.; assistant ship draftsman, Boston, Mass., in the Bureau of Construction and Repair (Navy Yard service), and at salaries of $5, $6, 5.04 and $4 per diem, respectively.

Persons desiring to compete should at once apply for application blanks (Forms 304 and 375), which should be properly executed and filed with the United States Civil Service Commission, Washington, D. C.

European Edition of the American Machinist.

Arrangements are nearly completed for the issue of the "American Machinist" in London, and it is expected that publication there will begin the first of the coming year. It is not yet practicable to give full particulars, but we may say that the "American Machinist" has been invited to go to England, the initiatory step which has led to the present project having been taken by a well-known English publishing house, and being based on what the paper had already accomplished abroad. The foreign edition of the "American Machinist" will differ from other foreign editions of American journals, in that it will include the American edition complete, advertisements and all. The new arrangements are expected to more rapidly add to the number of our readers abroad and to be productive of good results for all concerned. Full particulars will be given in due time.

In the description of the Secor kerosene engine published in our issue of October 5, we inadvertently omitted to give the address of the makers, and as we have received numerous inquiries, we here give it, as follows: The Secor Works, foot of Forty-third street and Bay Ridge Bridge, Brooklyn, N. Y.

Commercial Review.

NEW YORK, FRIDAY EVENING,
October 20, 1899.

ENGINEERING NEWS AND NOTES.

Reports received from a number of representative engine and boiler manufacturers indicate that the demand for steam power plant equipments is still excessive. Indeed, it appears to be unabated. At some selling offices orders footing up to a considerable magnitude are still being allowed to pass by because acceptable deliveries cannot be offered. Thus, the local office of one of the largest engine building concerns in the country is in a state of enforced inactivity because of the congestion at the factory. Parties who want to install boiler plants next spring are showing their faces in the market. A boiler company which has noticed a little falling off in its trade and later a recovery, attributes it to the fact that this year's buyers had covered their requirements, and that next year's are now coming along.

The prices of some makes of boilers have been given further advances within a space of some three or four weeks past. Engine prices are still strong, and the upward movement is yet noticeable to a greater or lesser extent.

In a recent competition among water tube boiler manufacturers to secure an order in Brooklyn, and in which it is stated the leading manufacturers pretty generally participated, we are informed that all offered to deliver in sixty days, and even as short a time as six weeks was named. This does not look as if boiler makers were in as desperate straits as common report on the part of some of them would have it. Four to six months is given as a prevalent length of time in certain instances, and one seller of fire tube boilers says that his company refuses to promise to ship by any definite date. A ray of light for waiters on plate and tube mills may be seen in the experience of a boiler manufacturer who informs us that he is getting plates more easily than hitherto, and that a boiler tube seller offered to deliver moderate lengths of tubes on ten days' notice.

The Westinghouse interests expect soon to make their own steel billets. The Westinghouse Machine Company, in addition to the present doubling of its plant, which, following hard upon a previous doubling, amounts to a quadrupling, and which is not yet completed, proposes to expend $1,250,000 in the erection and equipment of a steel plant having a daily capacity of 80 tons of billets, a steel forging plant and a foundry. A portion of the product will probably be taken by the Westinghouse Electric and Manufacturing Company. The new plant will be situated to the west of the present works of the Westinghouse Machine Company, at East Pittsburgh, and across the line of side tracks which is switched off from the Pennsylvania Railroad, as the many persons familiar with the location of the works may understand.

For the One Hundred and Twenty-ninth street power house of the Third Avenue surface road of this city another 600 horse-power Westinghouse engine has been ordered. There are six of these already installed. This last has been promised for remarkably quick delivery for present times. The manufacturers have it in stock and expect to ship it before the end of the year.

The Baltimore & Ohio Railroad Company has placed the following orders for Roney mechanical stokers: 1,650 horse-power for Baltimore, 825 horse-power for Cumberland, Md.; 825 horse-power for Garrett, Ind., and 550 horse-power for Newark, Ohio. A sale of 3,600 horse-power of such stokers has been made to the Baltimore Belt Line, or tunnel road.

Mr. J. G. White, of J. G. White & Co., engineers, this city, returned from England about a week ago and brought with him plans for three pumps of 2,500,000 gallons capacity each, for a mining plant extension of the Deep Leads Transmission Company, situated near Melbourne, Australia. The firm is in communication with American pump makers in order to get them to submit designs for these pumps based on American practice, and also, by way of alternative, it is desired to get prices on three or four pumps based on English designs. The firm has just ordered a 600 horse-power cross-compound Buckeye engine for this plant, and expects to place a duplicate order within a few days. From the General Electric Company will be procured, so far as at present decided upon, two 400 kilowatt alternating current dynamos and three 250 horse-power motors, and probably more machines than these. The boilers will be English Babcock & Wilcox, purchased in Glasgow, and will have wrought steel headers.

J. G. White & Co., who are engineers and contractors for the Detroit & Lake Orient Railway, have ordered for the Rochester (Mich.) plant a 600 horse-power compound Ball & Wood engine and a 400-kilowatt Crocker-Wheeler generator. Water tube boilers to the amount of 500 horse-power will be ordered, but the make is not yet fixed upon.

Several of the more important lines of railroad are putting in electric light plants at points on their routes, as shown by the experience of the Watertown Steam Engine Company. The Pennsylvania has ordered several large vertical compound engines for various of its branches; the New York Central and the Ontario & Western have also placed contracts. The Watertown Engine Company has export orders for engines and boilers for Germany, Cuba and Mexico. It has lately sold several direct-connected engines in this vicinity. A pretty good-sized engine and boiler plant is under construction for a paper mill near Watertown, and two 350 horse-power engines are being built for it. Five more of the same size are under construction for other purposes.

The Watertown Engine Company is crowded to fullest capacity, being especially hard pressed in making boilers. In this district engine and boiler contracts to the amount of $15,000 were turned down in the last two weeks. There is nothing that looks like a slackening of demand visible at the local office. The company has on the market an 1899 improved type of high-speed engine, and the comments made upon those which have thus far been installed are stated to have been very favorable.

The Pierce-Crouch Engine Company, New Brighton, Pa., manufacturer of gas and gasoline engines, is adding to its plant new machinery of the latest improved types, and the output of the factory will soon be doubled. We are in receipt of a list of notable sales made by this company since the beginning of fall to parties in the Pittsburgh district. Among them are several 35 horse-power engines for running electric lighting plants. Sales since the first of October comprise in part: One 50 horse-power engine to the Pittsburgh Valve and Machine Company, one 50 horse-power to the Record Milling Company, and one 40 and one 50 horse-power to the Standard Horse Nail Company, New Brighton. This last order makes eight gas engines purchased by the Standard Horse Nail Company, the first having been put in four years ago, and the others added as occasion required. The entire plant will be run by gas engines when these two new ones are installed.

Mr. Charles Churchill, of London, has arrived in this country, in accordance with an announcement previously made, and reports that English business in American machine tools is still growing rapidly, and that there is every prospect of a continuance of such growth. His company is now opening a house in Manchester, so that it will have branch establishments in Birmingham, Manchester and Glasgow. A statement he makes is of particular interest in connection with some correspondence we published some time ago regarding the Manchester branch of the Cleveland Machine Screw Company, this statement being that in a single month the firm of Charles Churchill & Co. ordered of that company eighty-three automatic screw machines, sixty of these being in one lot, and twenty-three subsequently within the same month. Such orders are, we think, rare here in this country.

The Carborundum Company, Niagara Falls, N. Y., is rushed with work, and is running overtime. This company is now making up its product into a great variety

of forms, including all those to which emery is adapted, such as cloth, paper and wheels; also whetstones, razor hones, holystones for ships' decks, etc. The company now has in operation fourteen furnaces. One of the lesser branches of the Carborundum Company's work is graphitizing gas carbons. A factory is to be erected near to that of the Carborundum Company, and having close relations to that concern, for the production in the electric furnace of graphite, such as forms next the core in the carborundum process.

The Landis Tool Company, Waynesboro, Pa., has erected and equipped a new building, which much improves the manufacturing facilities of the concern.

It appears very much as if the twist drill manufacturers, who already have an informal union to regulate prices, were trying to get together in some more organic sort of union. A Cleveland dispatch says twenty-five of them are holding a secret meeting at the Hollenden in that city, apparently with such a purpose in view. They are trying to keep their own counsels very close out there, as they did at the time of the gentlemen's agreement.

A new shoe machinery trust has been organized. Last February the United Shoe Machinery Company was chartered with a capital of $25,000,000, but several companies were left outside. A number of these have filed articles of incorporation at Trenton, N. J., as the Standard Shoe Machinery Company, capitalized at $5,000,000. This is the outcome of negotiations which have been under way for many months. In the Standard Shoe Machinery Company are comprised the Woodward Manufacturing Company, the Bay State Shoe Machinery Company, the Sinning Lasting Machine Company, McDowell's patents, etc.

The Kolomna Engineering Company, of St. Petersburg, Russia, has recently increased its capital to $3,750,000, with the purpose, it is believed, of making plant improvements calling for a considerable quantity of machinery, tools and supplies.

The Finland state railways are reported to have placed a second order with the Richmond Locomotive and Machine Works, calling for ten ten-wheeled locomotives.

NEW ENGLAND NOTES.

A recent trip through New England shows the shops of that vicinity in a full state of activity. Enlargements seem to be the order of the day. The testimony is uniform that the volume of foreign trade shows no diminution, although the great increase in domestic trade makes the sales to foreign account smaller as a percentage of the whole than formerly. At one place, of ten machines in the shipping room being boxed for shipment, nine were for foreign parts. This was, of course, an exceptional day, but at another place the proportion of foreign orders was stated to be above 60 per cent. of the total.

The new extension to the machine shop of the Bullard Machine Tool Company is nearly completed, and a new blacksmith shop is well under way. At the works of the F. E. Reed Company a four-story extension, 130 x 50 feet, is nearly completed. Two new Brown engines of 125 horse-power each are being installed to replace the old engine. One is for power and one for an 1,800-light dynamo. The Woodward & Powell Planer Company find their old quarters too small, and are erecting a monitor roof shop 200 x 84 feet, with side galleries. At the Brown & Sharpe Manufacturing Company's works the extension mentioned in these columns recently is nearly completed, and ground has been broken for another five-story building.

CHICAGO MACHINERY MARKET.

Large steel plants have recently been voracious buyers of second-hand Corliss engines of about 1,000 horse-power. A few of these have come upon the market partly from cable street railway companies which have changed to electric systems and discarded their old equipment. The purchase of second-hand power by first-class users has been a matter of necessity, not of choice, and emphasizes the straits into which the engine trade has fallen. It is almost as difficult to secure an old engine as one from the shops, and for the latter deliveries are as distant as a month ago.

For both boilers and engines the demand is persistently good. The Chicago representative of one engine builder says trade is quiet, and that he looks for an easier condition of the market. His digest of trade is lonesome and alone. The statements of business from other sellers are universally cheerful. As installations are usually made either in the fall or spring, and as it is now too late to secure deliveries this fall, some business is being deferred. An instance of this is in the lighting plants, which have at this season been accustomed to buy on thirty days' notice, but now find they must wait about ninety days. Notwithstanding this tendency to procrastinate, there is a large volume of business in engines and boilers being concluded for shipment up to next fall, or periods still more remote. Engines often cannot be bought under that time, and purchases of boilers are made conformably. A notable improvement has occurred in the demand for boilers of moderate capacities, from 100 to 200 horse-power. The demand is for miscellaneous factories, and mostly from old companies who are increasing their capacities.

The Wisconsin Central Railroad Company is in the market for additional power and machinery for its new shops at Fond du Lac, Wis. The Chicago & Northwestern is now installing in its new shops in Chicago two 300 horse-power engines built at Erie, Babcock & Wilcox boilers of 1,500 horse-power, a set of plate-bending rolls bought from Wickes Bros., and a variety of other machinery. Railroad companies generally are buying liberally. Several new boiler shops have lately been equipped with machinery, among them the Hamler Boiler and Tank Works, Thirty-ninth and Halsted streets, Chicago.

The American Street Railway Association met in annual convention at Chicago last week, and was well attended both by members and by machinery men. The exhibits of the latter were unusually good.

The E. P. Allis Company has sold several 2,000 horse-power engines for street railway service at Havana, Cuba.

Ide & Son sold to the Indiana Southern Railroad Company for delivery at Bedford, Ind., a 125 horse-power engine and another of 45 horse-power.

Quotations.

NEW YORK, Monday, October 23.

Iron—American Pig, tidewater delivery in 1900:—

Pensylvania Irons:	
No. 1 X foundry	$23 60 @ $24 00
No. 2 X foundry	22 60 @ 23 00
No. 2 plain	21 25 @ 22 00
Alabama Irons:	
No. 1 foundry	22 75 @ 23 50
No. 2 foundry	21 75 @ 22 50
No. 3 foundry	21 00 @ 21 50
No. 1 soft	22 25 @ 22 75
No. 2 soft	21 25 @ 21 75
Foundry forge	20 50 @ 20 75

Bar Iron — Base sizes — Refined, mill price on dock, 2.20 @ 2.35c.; store price, 2.60c., upward; common from store, 2.50 @ 2.60c.

Tool Steel—Base sizes, Standard quality, 7 @ 8c.; extra grades, 12 @ 14c.; special grades, 16c. and upward.

Machinery Steel—Base sizes—Ordinary brands from store, 3 @ 3.15c.

Cold Rolled Steel Shafting—Base sizes—From store, 4c. for carloads, 4¼c. for smaller lots.

Copper—While higher prices are still quoted in some quarters, the market has weakened to about the following prices: For Lake Superior ingot, 17½ @ 17¾c.; electrolytic, 17 @ 17⅛c.; casting copper, 17c., nominal.

Pig Lead—Carloads, 4.62½ @ 4.65c.; wholesale lots, 4.60c.

Pig Tin—In 5 and 10-ton lots, f. o. b., New York, 31½ @ 31¾c.

Spelter—Prime Western in carload lots, 5.25 @ 5.35c.

Antimony—In cask lots or over, Cookson's, 11 @ 11¼c.; Hallett's, 9¾ @ 9⅞c.

Lard Oil—Prime city, present make, ice-pressed, 45 @ 46 c., in jobbing lots.

Casting a Cylinder in Dry Sand.

BY R. H. PALMER.

Fig. 1 is the top, Fig. 2 the side, and Fig. 3 the end of the cylinder to be cast. Fig. 4 is the beginning of the molding operation. The board *A* is placed on its bed on the floor, and rubbed to a bearing, care being taken that it is not winding. The best way is to use a spirit-level across the ends of the board.

The drag half B of the pattern is then placed on the board, and the drag half of the flask lowered around it. The gate-sticks *a*, Fig. 5, are placed, and the pattern faced with a mixture of 1 part coarse Jersey fire sand and 2 of molding sand, with 1 part flour to 14 of the sand, sometimes adding 1 part of dried horse-dung, sieved, to 16 parts of the above mixture. Wet with thin clay-wash. Mix the clay-wash so that when you put your hand in it the veins will show through the clay-wash. The gate-sticks are also faced with it.

In ramming up the drag half, as we come to the hight of the rows of holes *A*, Fig. 7, we insert 5-16 inch rods, letting them come to within 1½ inches or so of the pattern, and in the last row of holes nearest the bottom board we let the rods run over the pattern, but not touching it by a couple of inches; also at the right hight set inlet gates *B*, Fig. 5, *A*, Fig. 6, from the uprights.

The drag being rammed up, we strike it off level, then throw on some loose sand and, taking the same strike, we hold a gagger, or anything of the thickness we wish, and run the strike across, thus leaving the same thickness all over of the sand we have thrown on.

We then take the bottom "boards," *B*, Fig. 7, which are also of iron, and lowering them on to the drag we rub them to a bearing, using small bars put into the bolt holes for handles. We then hoist off, and, taking a corner edge of the strike, pound some channel-ways across the drag, then sprinkle down, and vent with vent wire. Replace the boards and bolt them to the drag with bolts through the flange *c*, Fig. 6, and the boards; also remove the vent rods rammed up in the flask.

For heavy flasks I prefer bolts instead of clamps, as clamps will slip sometimes, even if they are apparently put on all right.

I have shown the board as in three parts, as it is easier storing them, and at the same time, if the holes are spaced so that the boards will fit in other than their own particular places on the flask, it comes very useful.

The bottom boards being bolted on, and the mold board as well, we roll the drag over, and after making the joint we place the cope half *A X*, Fig. 5, of the pattern on. The cope is lowered on after a thickness of ⅝ inch of facing sand has been placed on the joint, also on the pattern, where possible, to receive gaggers. We also set gate-sticks for gates, and risers, also the four plugs on the tops of the prints of the exhaust and steam-chest ports, and clamp together the cope and drag, and then, after setting gaggers, proceed to tuck the bars where needed; but in dry-sand work fewer bars are needed than in green sand, and the bars in the cope are left farther away from the pattern, so usually the ramming tucks them. It will save time to have the bars 3 inches away from the pattern, if possible, and set some gaggers, and let the rammer do the tucking, than to have them nearer the pattern, and try to tuck them, either with the hand or with a small rammer. Insert between the bars the rods for the vents through holes in sides of flask. These rods when removed leave holes for steam to escape, while the mold is drying, and gases when pouring.

Having rammed up the cope, we strike off, and sprinkle down with some clay-wash to make a hard crust when baked or dried, and vent. We then draw out the gate-sticks, also plugs on prints, also vent rods. We then hoist off the cope, swing away, turn over and make the joint. When making the joint do not leave the joint too full next the pattern; remember that when a dry-sand mold goes together, it does not give like green sand.

We then draw out the pattern from the two parts, cutting gate *A X*, Fig. 8, connecting the upright gate in the cope with the upright gate *A* in the drag, also drawing in the gate *B*, Fig. 5, in drag. After both parts are finished, we black and slick the mold, and place in oven to dry.

I have shown the exhaust chest split down the center at X, Fig. 7, which, as I understand it, is done when a part of the exhaust steam is used for one thing and part for another. In this case stud chaplets are used over and under the cores at the end next to the partition to hold them in position, as at *O D*.

In making the center core where engine work is a specialty, cast iron core-barrels

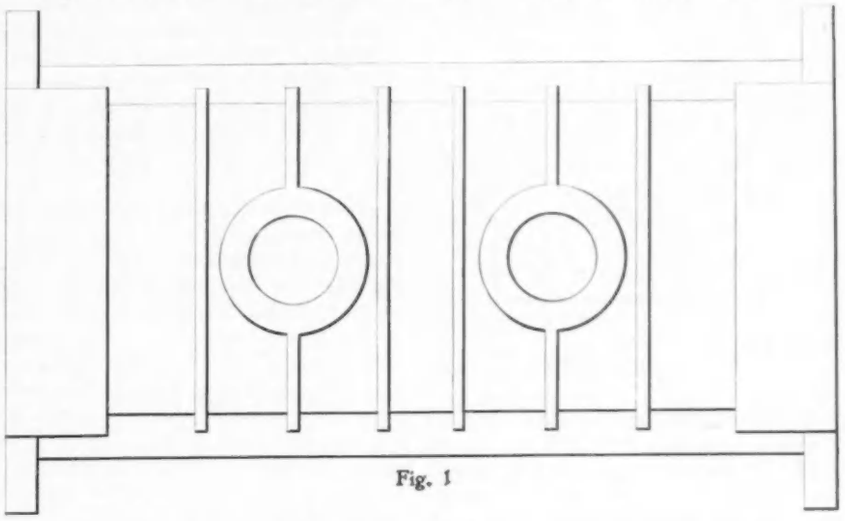


Fig. 1

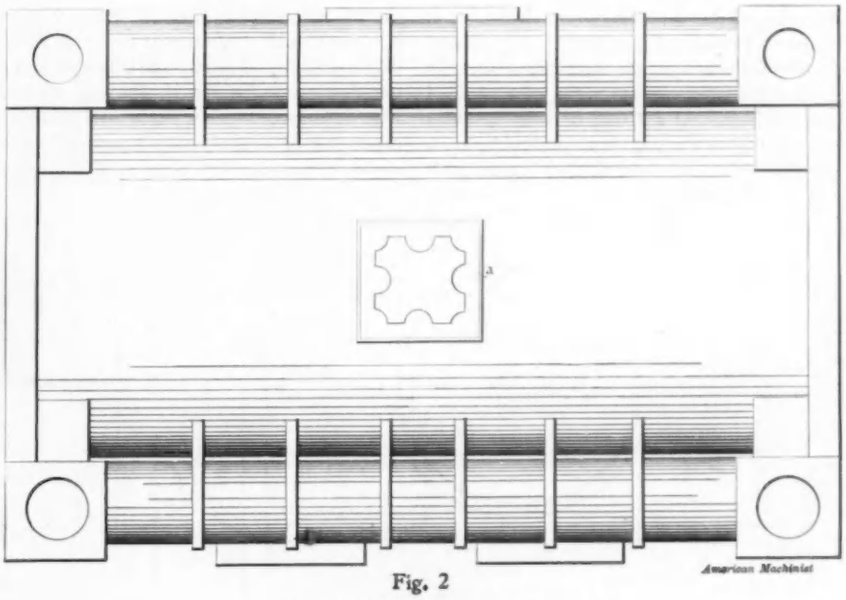


Fig. 2

THE CYLINDER TO BE MADE.

are used to make the center core on. They are made so as to leave a thickness of sand between them and the casting, varying, according to weight of casting, from 1½ to 2 inches of sand. At Fig. 6 I have tried to show the end of such a core-barrel in the center. This core-barrel is cast in

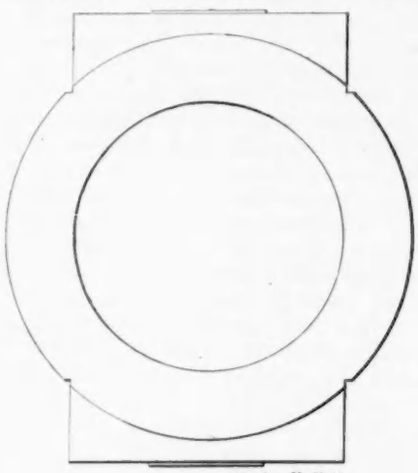


Fig. 3

END VIEW OF CYLINDER.

halves and bolted together at each end, as shown by bolts *w*. At *E* will be seen the thickness of casting forming the barrel; on the outside will be seen prickers or lugs *x x* to help hold sand on to core-barrel, while *v* will show holes cast through the barrel for vents. The barrel is also bolted together near the center by scooping pockets in the sides of each half for the bolt. At *I I* will be seen two ties running from the center to each side, with a hole *Y* in each. The way these two half-barrels were used in making the center core was to place two iron plates, made for the purpose, on horses, one plate having a true edge and this edge coming to the edge of the horse, the plates dropping on to pins in the horses. The halves of the core-barrel were clay washed. One half of the core-barrel was then set on the plates, a certain distance from the straight edge, on which the guide of a strike was to work. A thickness of sand was then worked on to the barrel by hand and hand rammer. A strike, a little larger than the half-circle wanted, was used, running on the plates with a guide on it bearing against the straight edge of the plate, and the core was struck off. The circle of the strike being a little larger, was to allow for slicking down in finishing. The core-barrel is raised a very little off the plates, so that when the two halves have been put in the oven and the sand dried on to them, they can be rubbed together a little, if need be, to bring them to the right size. They are then bolted together, the joint having been pasted, and slurried, as if they were two solid half sand cores. It means quite a saving of sand in the run of a year.

The steam and exhaust chest core-boxes are so arranged that when these cores are made the box, which consists simply of the sides, and end posts, as we call them, on the steam, really forming a steam chest, as the post is square while the exhaust post is round. A plate large enough to carry the core, and at the same time heavy or strong enough, is placed on horses, being sure that it sits firmly. A part of the posts, the round, or print, ends, are formed on dryers, or plates, made the shape of the part of the core that is wanted. These dryers are screwed to the skeleton core-box, and really form a part of it. A rough cast iron arbor is used, consisting of a post running up and down in the port core *H*, Fig. 6, and connecting these two posts are a number of slats or rods running lengthways of the core-box *H*, Fig. 7, the whole being one casting, cast from a special pattern; and each size of this style of cylinders has its special core arbor or skeleton pattern. The dryer parts are placed on the plate and the skeleton or arbor placed in the box, and the skeleton box placed around it. Vent rods are run through the ends of the box, coming out at each end; a rod is laid in the post coming out at the top at 2, Fig. 6. In a core of this kind for a 24x48-inch cylinder wax tapers would not be long enough and would be too costly. The port proper has a little sea coal mixed in the sand. While requiring a little more care, perhaps, for handling, and a few more rods, as *G G*, Fig. 6, it causes the sand to burn up more, and the core cleans out easier. This part of the core is vented with a vent wire run down to the rod referred to

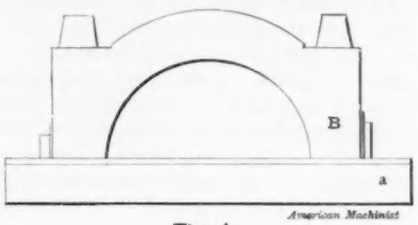


Fig. 4

FIRST OPERATION.

in the upright post. These vents are stopped up after being made, while the core between the posts is struck off with a strike or sweep formed to the required shape. Being rammed up, the rods (vent) are drawn out. Oil these rods well before using. After the rods are out the core-box is unbolted, screws holding dryers taken out, and the skeleton box taken apart, leaving the core sitting on its plate. It is then finished and placed in the oven. When dried the vents are blown through with a pair of bellows; the vents running lengthways out of the sides of the posts are then stopped up. Care is to be taken here. If improperly stopped, the iron is going to get in and stop up at least a portion of the network of vents, which means trouble.

Let us suppose that mold and cores are dry. The best way to form a bed for a flask of this kind is to make a bed long enough, then rub a 2-inch plank down in the center to a bearing; lower the drag center on to it and block and wedge under

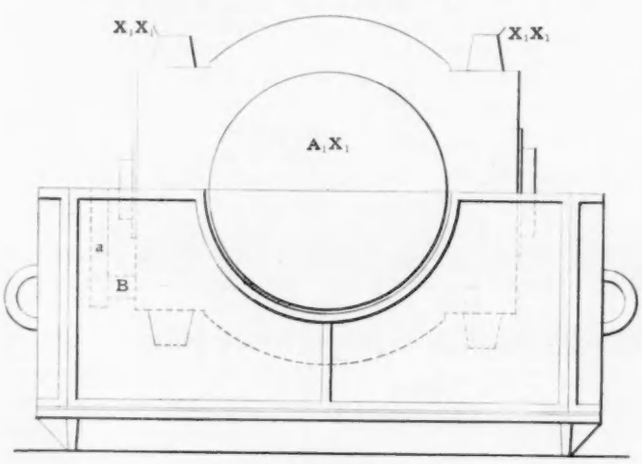


Fig. 5

READY FOR THE COPE.

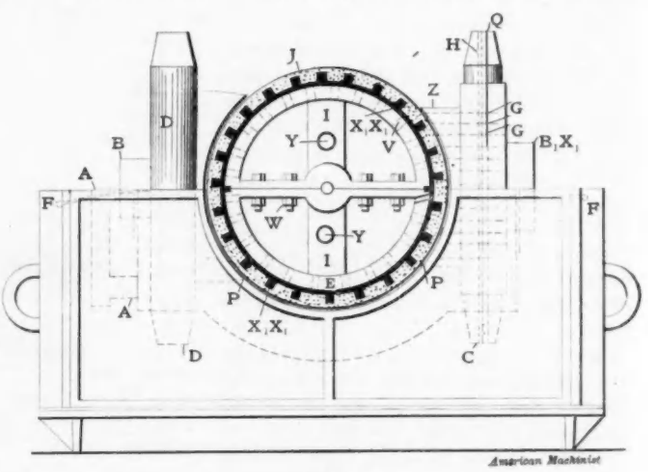


Fig. 6

SECTION SHOWING CORE BARREL.

the ends of the cleats. The steam and exhaust chest cores are next set, *C* and *D*, Fig. 6, but outlet cores *B B*, which are made in special boxes, are left out. The points of the port cores proper, *P P*, are cut back some.

These chest cores are handled by crane, with hooks on the chain catching into staples cast into skeletons spoken of, placed at *c c*, Fig. 7, and after being used are covered over, and covering dried with hot plates. I should say they, of course, do not come above the surface of the core, and the core is dug out while green around them to provide room for the hook to enter staples.

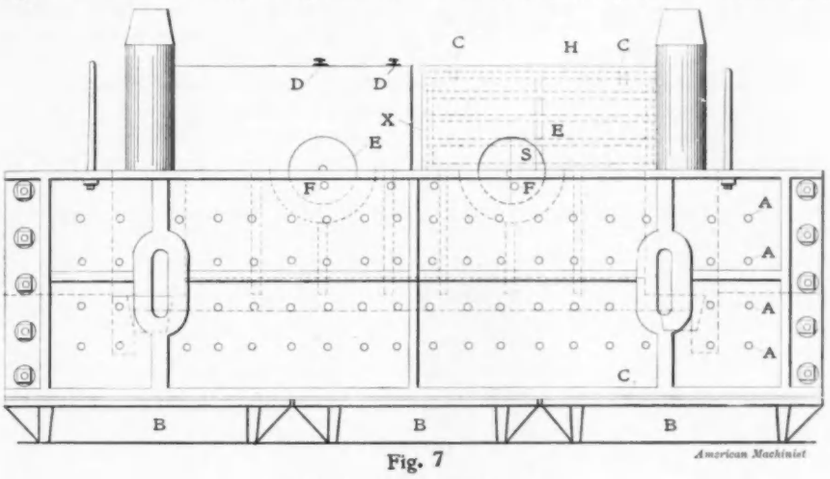


Fig. 7

LOWER HALF OF MOLD.

The center core is next caught by the crane, and is passed in endways between the port cores or chest cores; the chest cores being tipped back toward the outside to give as much room as possible for the center core to be run in between the points of the ports; also, the lower points being cut away, allow them to be guided back and forward, as required by the man attending to them while the core is being set. The center core is usually thrown a little above the center, thus allowing more finish when boring the cylinder, as dirt is floated into the mold in the iron, and rises on top of the inflow, and in that way is washed up against the center or barrel core of the cylinder.

When dirt once lodges against a core, there seems to be an attraction between the dirt and the core, so that the iron will seem to flow around it, and, in fact, it would seem as though one point of the scale, or flake of dirt, simply caught, and then the upward force or flow of the metal simply turned the dirt up against the core and fixed it there.

Now, I have given the way these cores are set; but it is when the exhaust chest is a whole core. In this one it is in two pieces with a partition in the center; consequently you have to set stud chaplets under and over the point of core (see *D D*, Fig. 6). I have shown two chaplets placed on the top of the core, which are supposed to be the right hight to give proper thickness of metal. You calipered your core and your pattern; you have divided the difference, and set your chaplets at these points under the core, and it is resting on them. It would hardly be the proper thing to rock the core back and forth with a part of it resting on these chaplets. Cut the whole circle back a little, and the point of steam chest spoken of, a little more, to obtain clearance. Use good tinned chaplets on steam work, if you wish the iron to get a good hold.

Now set the outlet cores from the exhaust chest, *B*, Fig. 7, *E*, Fig. 6, and through them wire back the chest cores. When you make these chest cores, measure off where you want a staple, and put one in, *S*, Fig. 6; then bring a wire through a hole in flask, as shown at *F*, Fig. 7, and shove a rod through it, as at *F*, Fig. 6, and wedge it. Set this core in warm, and paste the end so that the paste will be around the hole made for the wire, to keep iron out between this core and the chest core, so that it will not get in and cut the wire. Then place a rod in vent of core and ram in sand back of it. In this way you have your core so that you know where it will stay, then remove rod.

We now hitch on to the cope and try it on. Long pins are seen at *K*, Fig. 8, which are really extra pins put in there to guide cope while trying it on with the cores in place. Swinging the cope over the drag, four men get on top of it, and looking down through holes made by plugs we rammed up in cope on top of prints of post cores to steam and exhaust chest, they guide the cores into the prints with rods. Letting the cope come to a bearing, it is then hoisted off, and the mold is carefully examined—a great many times a slight crush occurs—and it is far better to remove the loose part, and oil, than to try to mend on to save the extra chipping. The joint is then pasted.

After the cope is closed, cotton waste is carefully tucked around the cores, and a spud with a head to it is placed in the hole, bearing on the cast-iron rod of the skeleton standing upright in the core *L*, Fig. 8, *H*, Fig. 6. Gas pipe *I*, Fig. 8, large enough to carry off the gas from the core, is connected with the vent of the core, and sand is carefully rammed in to the top of the cope. Across the two spuds a cast-iron binder, as *H*, Fig. 8, is then put and clamped on each side as shown at *F*, Fig. 8, and the spud *c*, Fig. 8, is wedged between the binder *H* and it.

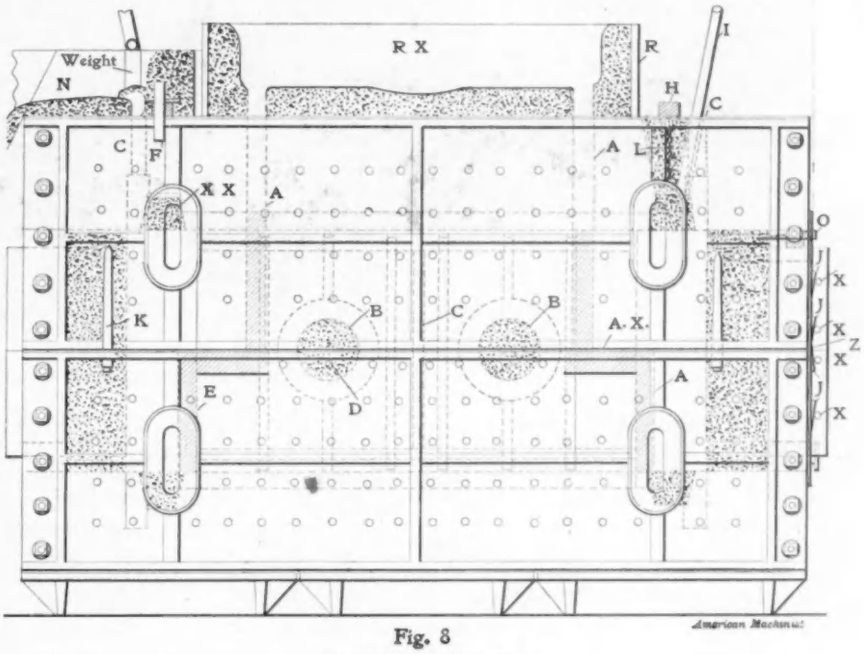


Fig. 8

THE MOLD COMPLETE.

The center core is carefully packed around, sand is rammed in between the barrel and the flange around the opening in the flask, and the core-barrel wedged down, *O*, Fig. 8. Half circular plates are

then placed around the core-barrel, and held in place by pins *X* in core-barrel and wedged between pin and plate, as at *J*.

The runner box *R* is then put on, and runner *R X* is built. Also riser boxes *N* are placed with a spout, or box running to a basin built on the floor (clay-wash the last box well), and run-off and riser are built. A ball of clay is placed in the hole to cover the riser, and weighted with just weight enough to hold it from blowing off or blowing out. This can be easily removed when the mold is nearly full. At the joint of the flask *z*, Fig. 8, it will be seen that there is a space made by setting the flanges of the flask back from the actual joint a trifle, thus forming a chipping piece, so that in fitting the flask together it is easily done by chipping. The space between these two flanges is rammed full of new molding sand. In securing the flask together, as I said before, I believe in bolts in preference to clamps.

In pouring, there is quite a difference of opinion regarding the temperature at which the iron should be poured. I would rather see it go into a mold good and hot, but with the snap out of it. Choke and keep the basin full, and, when full, flow through some if for any cause the iron does not seem still in the mold; but I do not think an excessive flowing through is productive of great results.

The arbors in the steam and exhaust chests are broken out through the port holes, also through the outlet cores of the exhaust chest and through steam inlet. The core barrel is sawed around with a thin piece of flat iron long enough to go through the barrel, and with teeth cut by a chisel in it near one end. It will then easily slide out.

Locomotive Saddle Planing Machine.

The accompanying half-tone and line engravings show a new tool for planing, or boring, as the reader may prefer to consider it, the saddles of locomotives at the seat on which the boiler rests. This operation has heretofore been done by hand chipping, and the machine shown is therefore new in every sense of the word.

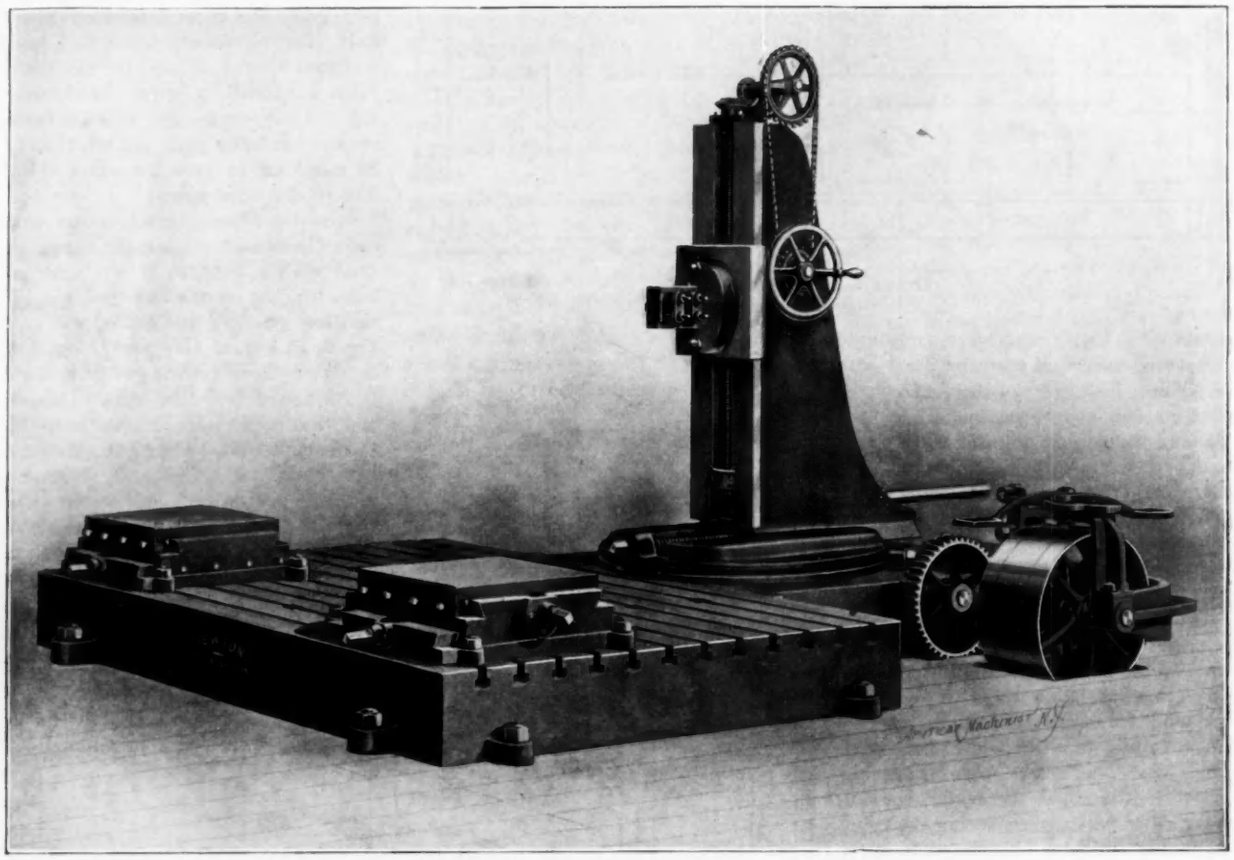


FIG. 1. LOCOMOTIVE SADDLE PLANING MACHINE.

The half-tone, Fig. 1, shows the general appearance of the machine, and Fig. 2 shows the method of holding the work and presenting it to the cutting tool. At the front of the T-slotted base plate two square blocks will be seen which are adjustable in position to suit work of various sizes. The cylinders are bored and faced before they are brought to the machine, and two round stumps, turned to fit the cylinder counterbores, but not shown in the illustrations, are bolted to the blocks, and when once set serve to at once locate and square the work. The post at the rear carries the cutting tool and reciprocates by an oscillating movement on an arc sufficient to embrace the saddle seat. The movement by which this is accomplished, as seen in both figures, is by dogs and shifting belts, similar to an ordinary planer, the movement having also a quick return like a planer. The feed is vertical. The actual driving mechanism will be seen to be very simple. It includes a pair of spur gears and a steep pitch worm and wheel only.

Two extreme sizes of cylinders are included in the plan view of Fig. 2 in order to show the range of the machine. Both of these cylinders have piston valves. Of the larger one *a a* are the cylinders and *b b* the valve chambers, while *c* is the saddle seat. Of the smaller *d d* are the cylinders, *e e* the valve chambers, and *f* the saddle seat.

The tool post will be seen to have an adjustment on its base by which the radial distance of the tool from the center of oscillation may be varied. In use the saddle is first bolted down in the proper position and the tool post is then adjusted to suit it and to give the required radius to the cut.

The saddle seat is not, of course, continuous over the entire surface, a chipping strip running around it. This gives a long cut at the start and finish, but short cuts between, and to suit this the stroke is ad-

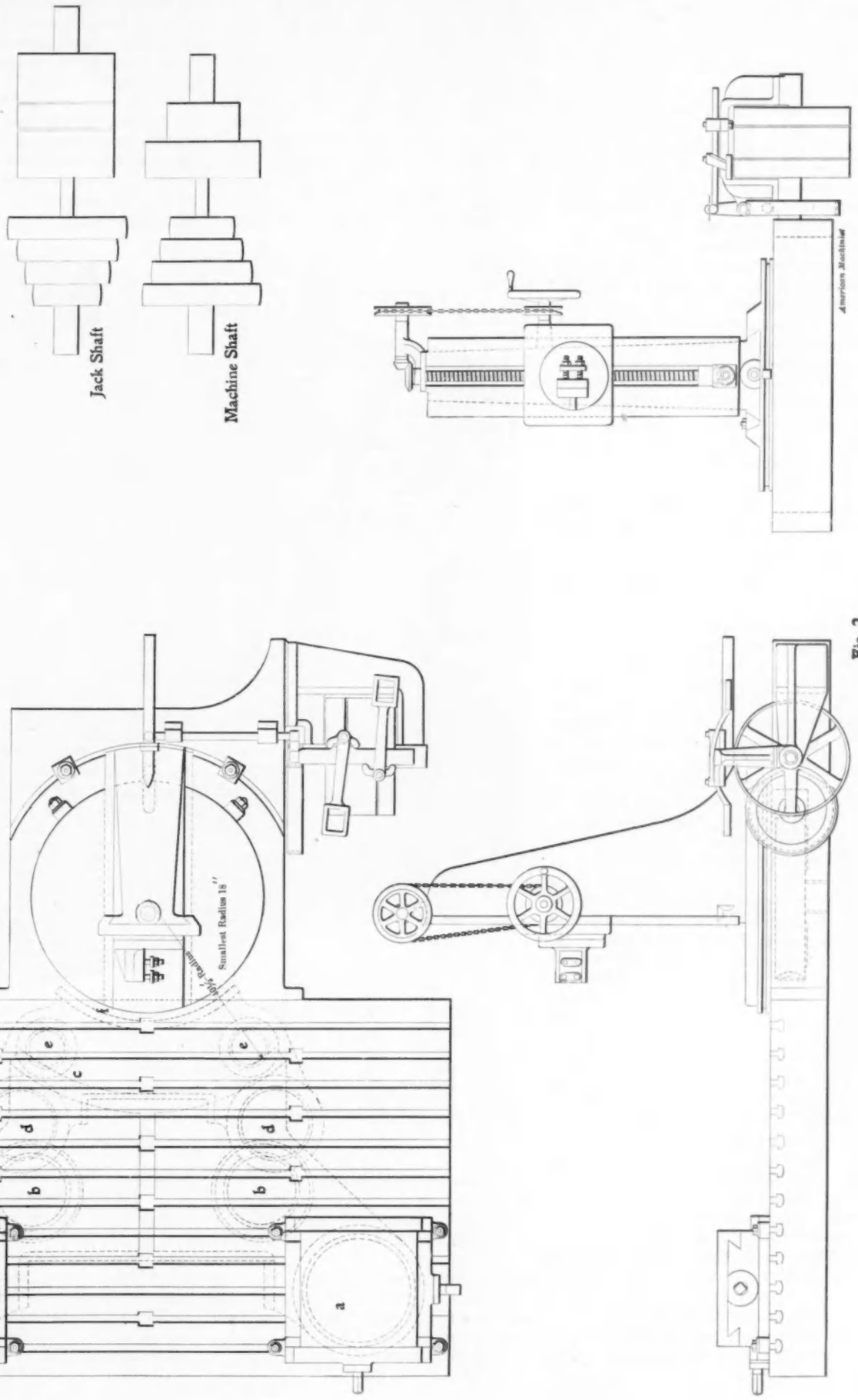


Fig. 2
LOCOMOTIVE SADDLE PLANING MACHINE.

justed in length to suit the cut. It is also obviously desirable to have the cutting done on the inward stroke in order to avoid breaking out of the metal as the tool leaves the cut, and to enable this to be done the tool is mounted on a swivel block which may be reversed, and thus cause the tool to face in either direction as desired. The reversal of the tool would of itself give the quick return on the wrong stroke, and to meet this condition an intermediate reversible countershaft is provided, as shown in the front elevation of Fig. 2. This intermediate shaft is driven from the line shaft by open and crossed belts, and the stroke in which the quick motion is made is determined by the belt which is thrown on the tight pulley.

The machine was designed and built by the Newton Machine Tool Works, and is now at work at the Baldwin Locomotive Works.

Electrical Switches—II.

BY WM. BAXTER, JR.

The quick action switches explained in the last article succeed in reducing the destructive effect of the spark upon the switch, but they are not very desirable so far as the generator and motors in the circuit are concerned, owing to the fact that if the duration of the spark is reduced the strain upon the insulation of the generators and motors is increased. When a circuit is opened the current tends to keep on flowing, and as the regular channel is disconnected it tries to complete a circuit through some other path. If there are weak points in the insulation they will be pierced by the current in its effort to close the circuit. The action of an electric current in this respect can be compared to that of a current of water brought to a sudden stop. Now, in the case of the water current, if the flow is checked instantly the force exerted by the current becomes very great, but if the flow is stopped gradually the reverse is the case. With electric currents the result is exactly the same, if the current passes through wire coils wound upon any mechanism. If the current dies out slowly, the kick, as it is commonly called, is slight; but an instantaneous stop may produce an enormous reaction, even if the current is small. From this it will be seen that quick action switches are objectionable because they increase the strain brought to bear upon the insulation when the current is interrupted.

To obviate the objection of the quick break and at the same time protect the switches from the destructive action of prolonged sparks, the type of switch shown in Figs. 16, 17, 18 is used. In this switch two sets of contacts are provided, one being made of copper and the other of carbon blocks. The first set of contacts is for the purpose of conducting the current with the least resistance possible, and the second set is to receive the spark at the instant when the current breaks. The copper contacts are the same as in any of the switches we have already illustrated, and the carbon contacts are shown in the three figures at *C*, their position being clearly shown in Figs. 16 and 18. As seen in Fig. 16, one of the carbon blocks is attached to the blade *S* by means of the clamp *d*, which is made of sheet metal and possesses a sufficient amount of elasticity to force the carbons together. The other block is held upon *N* by means of clamp *e*. In Fig. 18 it will be noticed that the carbon blocks are lapped much more than the copper blade *S* and the contacts *N*, and the result of this is that when the blade is raised, *S* will leave *N* before the two carbon blocks separate. As the copper contacts separate before the carbons do, there will be no spark produced between the former, for the current can still flow through the carbon contacts. When these latter separate, the current will break; but as the carbon can be easily replaced, it matters little how much it is burned by the spark; hence, the duration of the break can be increased if desired by moving the switch slowly. For very small currents a switch can be made with carbon contacts only; but this construction cannot be used for strong currents, as the resistance of the carbon blocks is much greater than that of the corresponding copper parts.

Switches of the type shown in Figs. 16, 17, 18 are made in many designs, but they are not used very extensively at the present time, except in connection with circuit breakers. Several years ago they were used very extensively, but although they prevent the destructive action of the sparking upon the switch blades and contacts, they are rather bulky and more liable to get out of order than the plain type; and this, no doubt, accounts for their not finding as much favor as formerly.

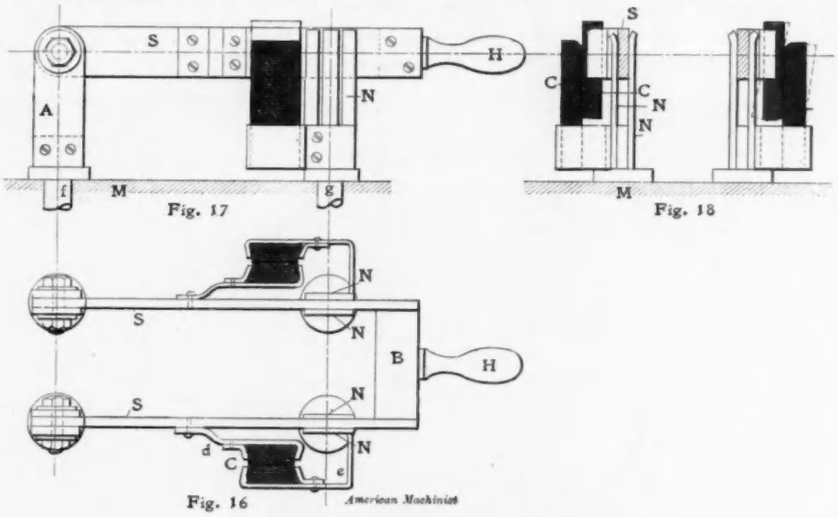


Fig. 17 Fig. 18 Fig. 16

SWITCHES WITH CARBON CONTACTS.

Switches on switchboards are not opened very often, therefore the effect of sparking is not serious except under abnormal conditions.

The stationary contacts *N*, and the blades *S*, of switches should be made so as to fit well, and also so that when the blade is lowered it will not be caught upon the ends of the jaws. Some manufacturers provide against the latter difficulty by bending the ends of the jaws outwardly, as in Fig. 19, while others leave them straight as in Fig. 20, and bevel the corners of the blade. Some men consider the construction of Fig. 20 to be the best, as with it the sharp corners of the jaws scrape the sides of the blade and clean the surfaces before they come into contact. It can be readily seen, however, that in the construction of Fig. 19 the sharp corners of *S* scrape the sides of the jaws; thus one construction does as much in the way of

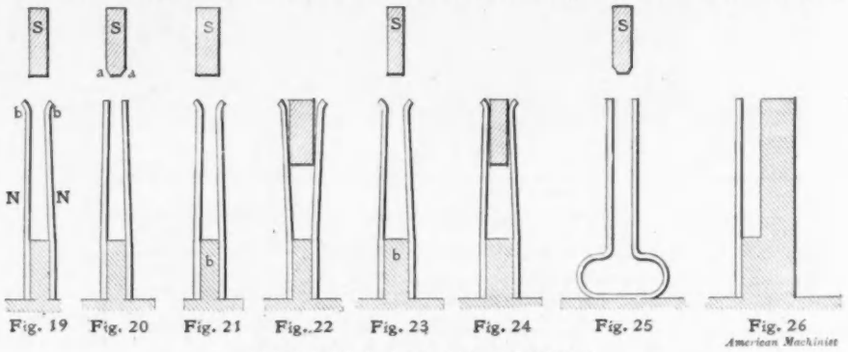


Fig. 19 Fig. 20 Fig. 21 Fig. 22 Fig. 23 Fig. 24 Fig. 25 Fig. 26

CONSTRUCTION OF SWITCH CONTACTS.

cleaning the surfaces as the other. With two and three pole switches, there is very little difficulty in making them so that the blade will always strike the jaws fairly, but with single pole switches such is not the case, for as the blade has but one support, and this can swivel, it is liable to get out of line unless well looked after.

The most important point about the jaws and blades of switches is to make them so that they will fit well. If the jaws are made long, they may apparently fit well when in reality they do not. To obtain a good fit, the part *b* to which the jaws are fastened should be of the same width as the blade *S*. The jaws should be made of sheet copper rolled hard so as to be springy. They should be bent at the upper edge of *b*, but only enough to slightly reduce the width of the opening at the top ends. With such construction, if *S* and *b* are of the same width, the jaws will stand parallel when the blade is in place, and there will be a bearing from edge to edge of *S*. If *S* is wider than *b*, as shown in Fig. 21, the effect will be as shown in Fig. 22 when the blade is in place; and if *S* is narrower, as shown in Fig. 23, the fit when the blade is in place will be as illustrated in Fig. 24.

The thickness of the jaws should be sufficient to make them decidedly stiff, so that they may have to be bent inward a very small amount to product the necessary clamping pressure. Some switch jaws are made of the form illustrated in Fig. 25, this construction being used under the erroneous impression that if there is sufficient elasticity, a bearing can be obtained over the entire width of the switch blade regardless of whether the fit is good or bad. This notion is not correct; the best results are obtained with short jaws, but the perfect fit is a matter of accurate workmanship.

As the resistance of the contact surfaces of the switch jaws is much greater than that of the body of the conductors, an extra amount of heat is developed at these points, and for this reason it is desirable to have as much metal near the contacts as possible. One way of increasing the bulk of metal is shown in Fig. 26. It is very commonly used in switches of the side-throw type, in which case the thick side of the jaw rests upon the surface to which the switch is attached, and the spring is placed on top. For knife switches this construction is not used, as it is not symmetrical and the advantages derived from its use are not sufficient to offset the lack of harmony in appearance.

The switches so far shown are made to be operated by hand, but there are cases where it is desirable to have switches that can be operated at a distance. Switches of this kind are arranged to be actuated by a magnet, and are called automatic switches. Some of them are constructed so that they can be either closed or opened by the magnet, but cannot be moved in both directions in that way; that is, if they are closed by the magnet they must be opened by hand, and the reverse. Others, of these switches, are made so as to act in both directions by means of the magnet. Fig. 27 illustrates a three-pole switch of the latter type. The two magnets are of the solenoid type and are wound with two independent coils which occupy the upper and lower halves of the spool, respectively. The switch is shown in the open position. If a current is passed through the coils wound upon the upper halves of the spools, the switch will be drawn up, and thus close the circuit. If now it is desired to open the circuit, the current is passed through the coils wound upon the lower halves of the spools, and then the switch will be forced down. The current that actuates the switch may be taken from the main line or from a battery, or from any other source. To send the current through either set of coils, or cut it off, simple push-button switches are used, one of which can be marked opened and the other closed. These push-button switches can be located at any point from which it is desired to actuate the switch. To illustrate, suppose we had a distribution box at the top of a building, and that it was arranged to feed half a dozen light circuits, and also a circuit running to another distribution box, this latter circuit to be shut off at a certain hour. By placing in the box an automatic switch and connecting it with the switchboard in the engine room by means of small wires, the circuit could be cut out by the simple process of pushing a button. Without the automatic switch it would be necessary to run up to the top of the building to accomplish the result.

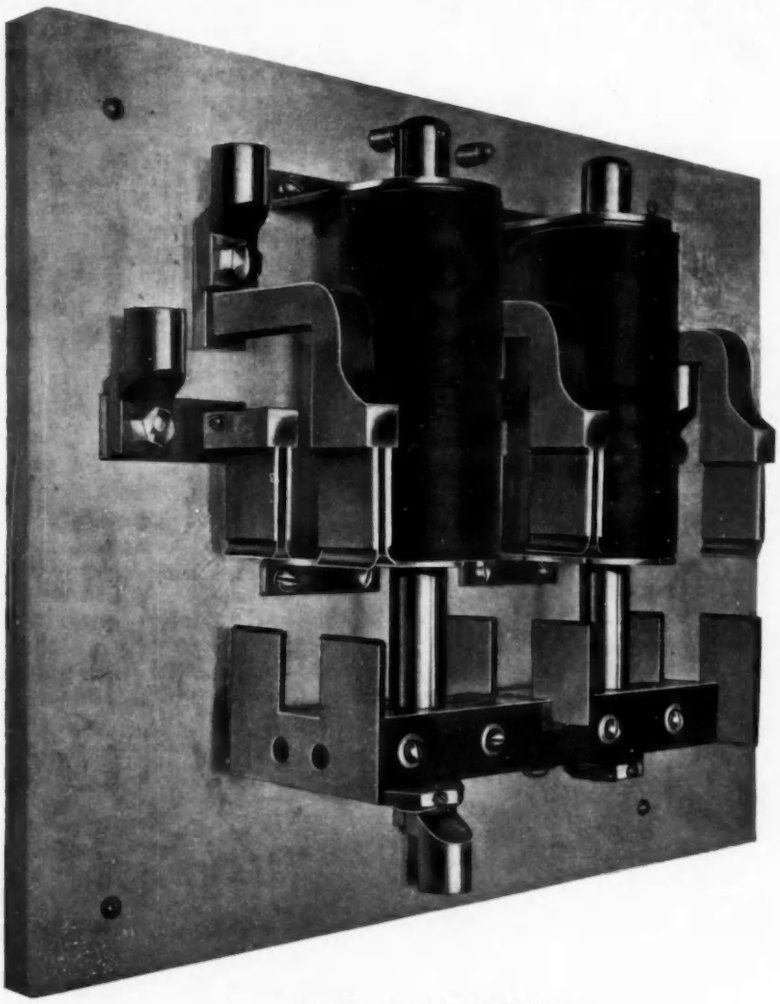


FIG. 27. THREE-POLE AUTOMATIC SWITCH.

The Machining of Crane Girders.

BY JOSEPH HORNER.

Some examples of the machining of cross girders of cranes by the aid of templets are given in the accompanying figures. These castings generally fit between the cheeks or side frames, against planed facings on the inside of the frames to which they are bolted. In some instances cross girders are bolted against the outer edges of the main frames; in some, again, they pass through holes bored in the frames.

Fig. 1 is an example of a girder which is bolted between frames—being one of the bottom girders. It encircles the cen-

tral post of the crane, and the bearings *A A* carry pins for the small side friction rollers, which revolve against a turned belt on the post. The bearing *B* is for an intermediate pinion shaft used in slewing. The templet provides for drilling all

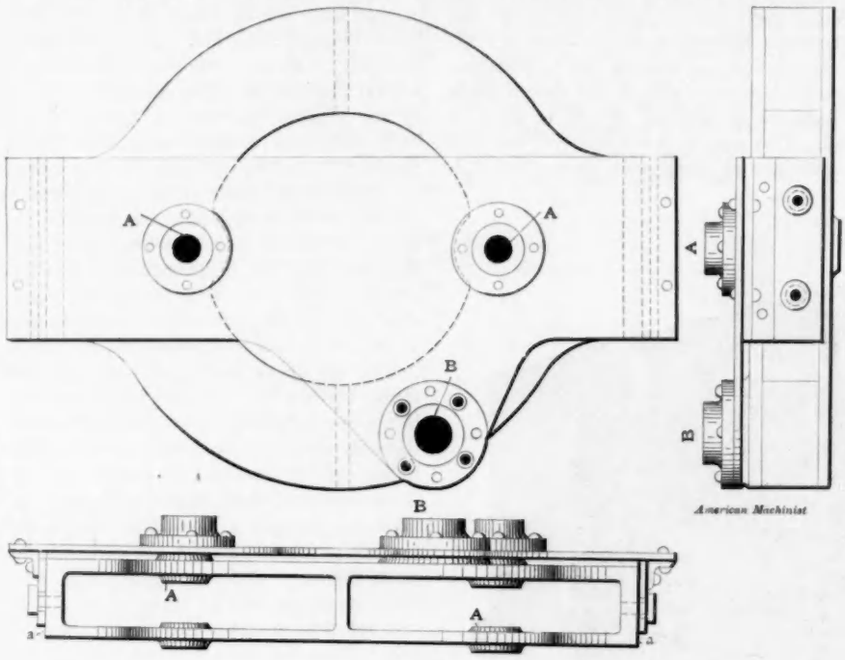


Fig 1

CROSS GIRDER.

the holes required in the girder. Before it is used the shallow boss facings of the bearings *A A* are planed on top and bottom, and the end flanges *a a* are planed and tested by a gap gage. The templet then just fits over the ends, resting on the bosses—and is clamped. The holes *A A* and *B* are drilled and reamed. The small holes in the ends are then simply drilled. The inner facings for the bearings *A A*, against which the faces of the rollers run, are arbored with a facing cutter under a drilling machine.

The drilling bosses for *A A* and *B* are of cast iron or of steel, not bushed. Being of good depth, they last for an indefinite period. Steel bushings are used for the small bolt holes at the ends. In the boss through which the hole *B* is bored there are four small steel-bushed holes. These are for drilling the bolt holes by which a foot-step bearing is bolted to the girder to receive the bottom end of the intermediate slewing shaft.

Fig. 2 is a templet used for one of the upper girders of a crane. There are two holes, *A* and *B*, to be bored at right angles to each other, and the end bolt holes in the flanges *a a*, in addition. In this case too, the ends are planed first by a gap gage, and the templet fitted. The templet is made of sheet iron, or steel. The ends are attached with angle-iron. The guides for boring the large bearing holes *A* and *B* are cast iron bosses riveted on the plate in the manner shown.

The templet being set, the half hole *A* is then scribed and the templet removed. A small templet, set by this scribed half circle, is used to mark the edges by which the cap is fitted, and these are then slotted or milled. The stud holes are drilled and tapped, the cap bolted in place, the work taken to the drilling machine, and the templet clamped on.

The two bearing holes *A* and *B* are rough drilled and reamed. They have to be at exact right angles, and, as the edges of the end flanges of the casting are not planed, there is nothing there to insure the correct setting for the boring of the second hole. An arbor fitting the hole first bored, and having a flanged end for bolting to an angle plate fixed on the table of the machine, affords a correct means of setting for the second bore—packing being inserted under the castings if necessary. The small bolt holes in the top face and in the ends are drilled through steel bushes, but not reamed. Finally the templet is removed and the faces of *A* and *B* counterbored.

Fig. 3 illustrates a sheave box, the ends *a a* of which pass through holes bored in the side frames. It carries the large sheave which runs beneath the jib. The small turned ends *b b* of the casting fit into holes bored in the feet to which the jib is socketed.

The ends are turned first to fixed calipers, the length of the shoulders being checked with gap gages. The templet fits over the inner turned faces, its ends being cut into semi-circles to bridge those portions of the ends which fit into the holes bored in the frames. The hole for the roller pin is drilled through the cast iron boss *A*, which is the only boring done on this casting.

Figs. 4 and 5 illustrate in plan and section the templet used on the bottom frame of a light type of hand crane. The side frames fit in the recesses *A A*, which are

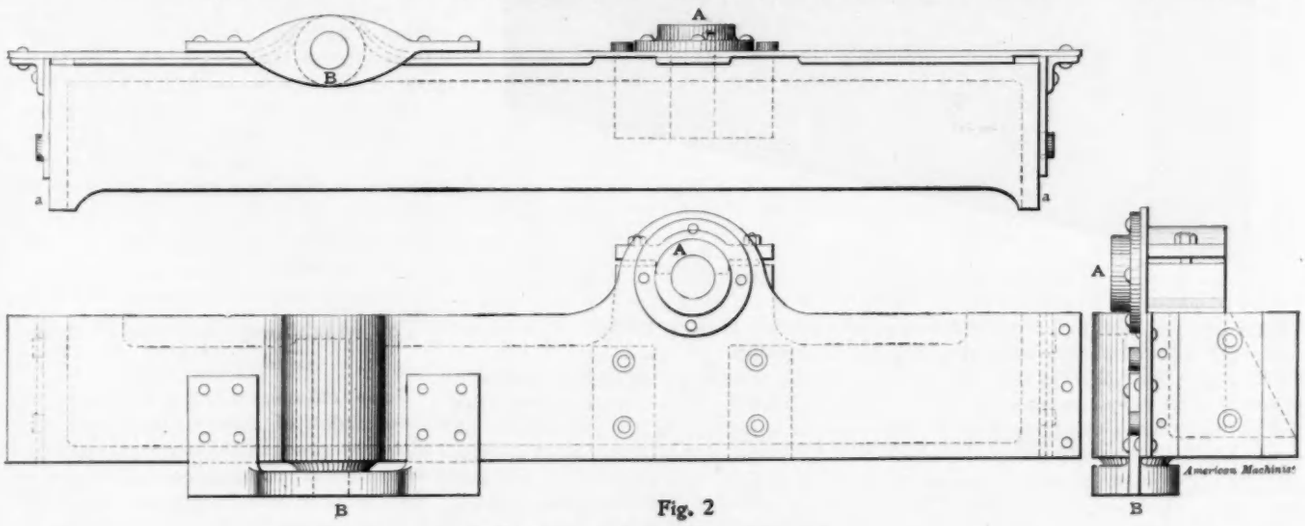


Fig. 2

TEMPLET FOR UPPER GIRDER OF CRANE.

machined to receive them, the side frames being bolted in position. The central post or pillar of the crane passes freely through the rough-cast hole *B*, and the rollers which make frictional contact round the post have their pins in the holes *G*. The extension *D* forms the seating for the flanged foot of a bracket, which carries the gears for slewing or steering the crane. The bracket carries bevel gear at the top, and its boss is extended down through the hole *E* to steady the vertical slewing shaft, on the lower end of which the pinion which gears into the curb, or slewing ring, is keyed. This casting, therefore, combines several functions, and as such cranes are generally made in sets, the mutual relations of the several details are insured by the use of the templet.

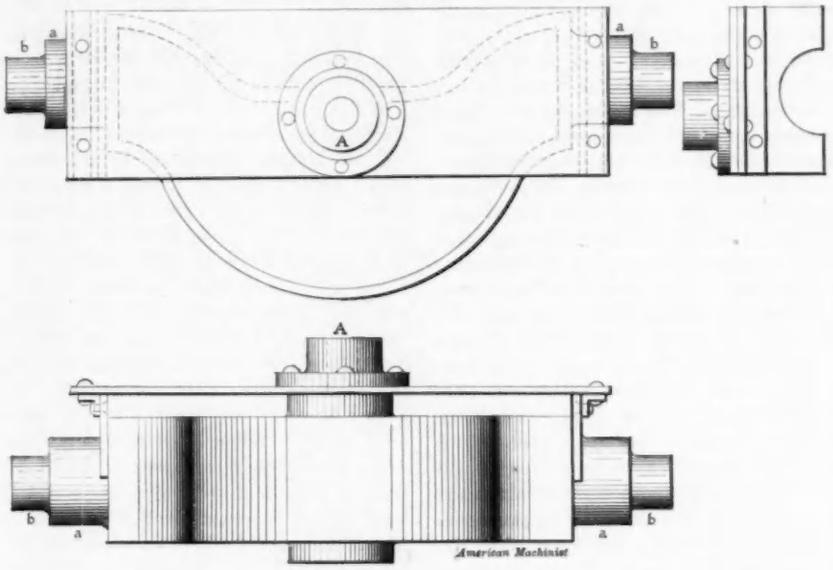


Fig. 3

SHEAVE BOX.

The templet or jig is made of a piece of sheet iron or steel, *F*, cut to the outline of the frame. The drilling bosses, *G*, for the roller pins are of cast iron. Though these bosses do not wear sensibly for a long time, yet it is well when large numbers of standard cranes are being made, to bush them with hardened steel, as shown in the figure. It is easier to renew a bush than an entire boss. The bosses *G* are secured to the plate *F* with rivets.

The face *D* being below the level of the top of the frame, a cast flange *H* is made of a suitable thickness to reach down to the flange face, and is riveted to the plate *F*. The flange receives four steel bushes, through which the bolt holes by which the slewing bracket is bolted to the frame are drilled.

The templet also furnishes the guide for planing or slotting the sides *A A*. These are simply scribed off, but the latter is removed previous to tooling. Thickness pieces are riveted on *F*, of the same thickness as the boss facings on the casting, so that they touch the top face of the casting, and insure the correct lining off by the scriber. The best way to tool the recesses *A A* is on the planing machine, rather than on the slotter, because the slotting tool is apt to spring in deep cutting. Small castings can be tooled expeditiously in a large shaper—being bolted to the table or to an angle plate. But as several cranes often have to be fitted at one time, a row of castings can be most conveniently bolted on the planer table and tooled in a row. The limits of accuracy in these dimensions are not necessarily very fine. Practical interchangeability in such work is secured by working to scribed lines, supplemented and tested by fixed gages, kept and stamped for each size of crane.

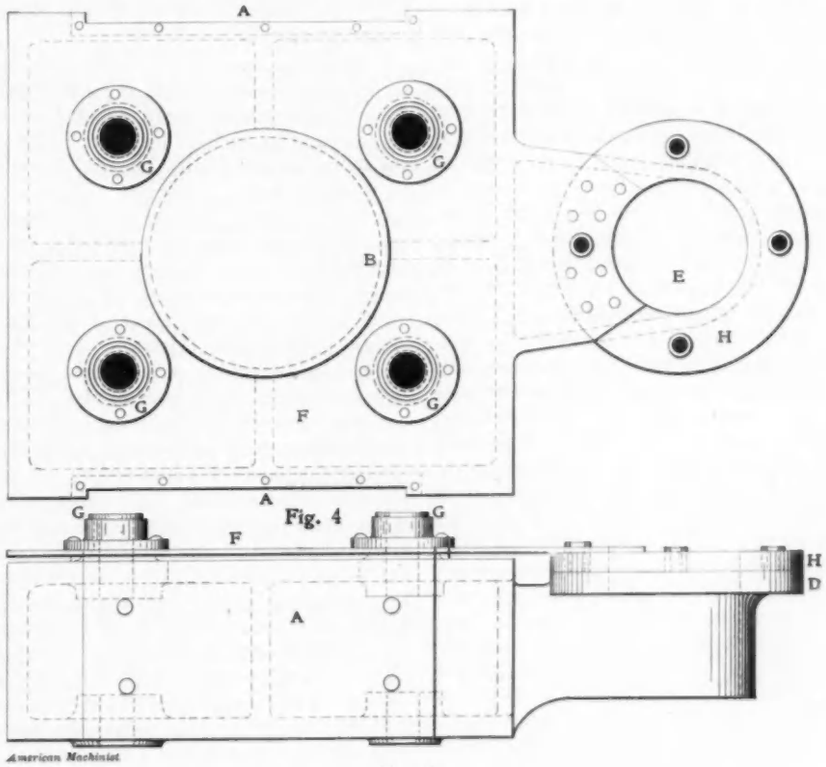


Fig. 5

TEMPLET FOR BOTTOM FRAME.

Finally, eight holes have to be drilled for the bolts which unite the side frames to the bottom frame. After the spaces *A A* are planed out, the insertion of a plain jig in these spaces will afford a guide for drilling the holes. Reaming is done by hand subsequently, after the side frames are set in their places.

American Machinery in the United Kingdom.

The following, taken from a report of the United States Consul at Edinburgh, Scotland, is worthy of perusal by those interested in the sale and manufacture of machinery for use in Great Britain:

"In reporting an interview which I had recently with an exceptionally intelligent engineer (machinist) in regard to American machinery and its use in the United Kingdom, I would say, by way of introduction, as showing how well qualified he is to speak, that for upwards of twenty-two years, including his five years' apprenticeship, he has worked at his trade in machine shops and factories in Scotland, England and the United States. His varied experience has included work in many Scottish factories, and nearly four years as foreman in a well-known general machine shop in New York. He is at pres-

ent chief engineer in a large factory in Lanarkshire.

"At one time he was employed in important locomotive works in England. On going to the United States, he first worked in the locomotive works of the New York Central & Hudson River Railway. He was here greatly surprised to see the rapidity of production, compared with the rate of production in the same branch of industry in England. He said to me:

" 'The average employee was able to turn out fully twice as much work in a given time as his fellow workman across the sea in Swindon. This remarkable result was accomplished largely through the use of improved machine and other tools. I afterwards found much the same difference in the rate of production existing in many other branches of manufacture. This was a number of years ago. Meantime, and especially during the past two years, the proprietors of engine and machine works in this country have been, by foreign competition, awakened to the necessity of discarding some of their British machinery in favor of American labor-saving apparatus. The result is that few well-organized works in the United Kingdom are now without a considerable proportion of such apparatus, and the proportion is constantly increasing. That it should thus increase is only natural, for this American machinery recommends itself at once. My present employers were induced to try American machinery only about a year ago. They now have five machines in use, while another of the same kind is at present on its way over from New York. I expect the amount of American machinery used by them will at least double within the next twelve months. The cause of their sudden conversion is not far to seek, and it furnishes a striking and convincing illustration of the value of American machinery. Before they began to use this machinery, the company had four British machines for preparing manila fiber for rope making. The combined daily output of these machines did not exceed 3½ tons. Each required two operatives. An American machine was introduced, costing $1,000—about the price of each of the British machines. It is worked by two operatives of the same class and receiving the same rate of wages as did those who managed the British machines. It is capable of turning out 5 tons of the product per day if pushed, and it actually does turn out 4 tons each day. The product from the American machine is of better quality than that from the British. When this American machine demonstrated its superior utility, others were added to the plant from time to time.

" 'Even the most conservative manufacturers in this country are now convinced, or are beginning to realize, that they can no longer afford to do without at least a moderate percentage of American general machinery, in addition to the common machine and other tools which have already been adopted everywhere. A great disqualification which much of the British machinery has, in addition to its being slow to work with, its its unnecessary weight. It is often absurdly heavy. I may say, without reservation, that machinery of every description is invariably made lighter in the United States than in Great Britain. This is one reason why it so often gets preference over British machinery; its lightness makes it better adapted to general requirements. The American designers and makers seem to have a happy faculty of properly combining lightness with strength and durability in machinery of all kinds. One sometimes hears misinformed or prejudiced persons say that American machinery is "jerry built." This is the reverse of true, as the machinery not only does fine work, but is well built from the best materials. As to durability, it lasts as well as any in the world. A fiber machine which my employers got from the United States eleven months ago has, since its arrival, been worked continuously ten hours a day every week day except Saturday, and six hours on Saturday. It has never been for a moment in the slightest degree out of order, and has never cost us a farthing in repairs, but has uniformly run without a hitch, and has at all times done its work faultlessly.'

"On the subject of rope and twine-making machinery, with which he is especially familiar, he continued:

" 'American machinery of this class is far in advance of that made in other countries. It has already been adopted to a great extent by each of the more important works in the British Islands, notably by those at Belfast, where, in addition to several American drawing frames, there is a full assortment of other American machinery, comprising various sizes of the other three principal classes of machines used in the industry, viz., balling machines, twisters and layers. . . . To rightly understand the problem which British manufacturers have to deal with, one must consider the differing industrial conditions in the United States and in the United Kingdom. Leaving wholly out of view the different economic systems, what do we find in comparing the two countries from an industrial standpoint? The wages of skilled labor in the States are from 70 to 90 per cent. higher than the wages of skilled labor here. Good wages inevitably mean greater efficiency of labor. Workmen are stimulated to put forth their best efforts. They work cheerfully, and therefore they work well. Moreover, the high scale of wages has been a strong influence in favor of the invention of machinery which gives labor a productive capacity corresponding to the wages received. If labor-saving machinery has thrown men out of employment in any branch of industry, they have quickly found work in another, so multifarious are the industries and employments in a country so vast as the United States. I personally know of cases in your country of workmen forced out by labor-saving machines getting immediate employment in making the machines.

" 'Now, turn to the United Kingdom. The laboring population is almost a fixed quantity, both in number and occupations. It is fixed in grooves. Once a bolt maker, always a bolt maker. Moreover, old methods are stoutly adhered to by the workmen. Their wages are comparatively low; their organizations are extensive and powerful. They have, as a rule, set their faces against labor-saving machinery, because the displacement of labor here is regarded by the masses as a very serious thing. I am inclined to so consider it. You can readily see why manufacturers in this country have been conservative. It is not because they have not desired to push ahead, to adopt every new device and every new method, and to run the industries at high pressure. They have simply been afraid to venture. But the tide of iron and steel and other manufactures rolling not only to our colonies, but also into our own markets from the United States, has compelled them to venture. It was a choice between a great, permanent loss of business and the risk of a struggle with labor. At first gradually, then quite largely, they have been importing American machinery, not only for various uses in iron and steel manufacture, but also for wood working, printing, binding, pumping, electric power, rope making, milling, paper making, sailcloth making, shoemaking, and so on. They have also been importing, as I have before stated, American tools of all sorts.' "

The Use of Boiler Compounds.

BY W. H. WAKEMAN.

It is commonly believed that foreign matter in the feed water of a steam boiler will not affect the quality of the steam, as it will all remain in the boiler, while only the pure water evaporates into steam, and the same reasoning is applied to compounds used for the purpose of removing old scale and preventing the formation of new, unless it be in the case of using kerosene oil, or something similar, that is known to evaporate or burn at a low temperature.

This is a mistake as regards some of the things that are put into boilers, as the following will show. On taking charge of a certain plant, I found the safety valves leaking steam continually, and I very naturally proceeded to grind them in as soon as an opportunity was presented to let the pressure off. On firing up again the valves were found to be tight, and they remained so until they were opened, when they began to leak again, and soon were in as bad condition as they were before the efforts to cure the evil. The performance was repeated, with no better results, after

which a new and heavier valve was made for one of the boilers, as it was thought possible for the pressure to spring the old valve, which was rather light, but the new one also soon leaked badly, and for a few days the job was given up in disgust.

Reasoning from effect to cause suggested the idea that the boiler compound that had been used there for years might be responsible for the trouble. It was discontinued and another substituted, when the leaks began to grow less, and in a month had entirely disappeared. They did not reappear for five years to my certain knowledge, which is proof enough that the so-called boiler compound rose with the steam and coated the valves so that after they were once opened they did not seat properly. The objectionable resolvent was soda ash, and the satisfactory one was refined petroleum. The latter worked well because when the particles floating on the surface were carried up with the steam they did not form an objectionable coating on the valves and seats, but, on the contrary, acted as a cleanser. Only small quantities of it could be used, as it formed a thick, pasty mass in connection with the impurities in the water, which would fill the water gage and try-cock connections, each of which were made separately, making it necessary to take the cocks off and clean the pipes.

In another case, where a patented compound is freely used, when the engineer cleaned his boilers, he found the shells above the water line coated with a substance as white as chalk, that filled the steam space with floating particles of matter when attempts to sweep it off were made, so that a stream of water was necessary to wash the plates clean. In such a case the steam contains some of the particles of matter when the boiler is under pressure, and these injure valve seats and disks, causing unnecessary leaks and wear.

Boiler compounds are frequently condemned because they cause boilers to leak, but this is not always a point against them, for if a boiler is so covered with scale on the inside of its heating surface that the water cannot reach the plates, heads and tubes, the heat will open the seams more or less; then if a compound is used the scale is removed and leaks are in evidence. Why should the compound be blamed for doing just what it is used for?

Of course there are cases where excessive amounts have been used through ignorance on the part of the fireman, but the blame should rest where it belongs, and not on the compound. In one case that I remember, a boiler inspector was called in the night to go and visit a boiler that was leaking in many places, alarming the fireman and making it difficult to keep the tubes covered with water. On inquiring what had been done, the inspector was informed that a large quantity of boiler compound had been used, for the fireman was laboring under the impression that if a little was good, much would be decidedly better. There is another reason for using only a small portion at any one time. If a large quantity of any good compound is put into a badly scaled boiler, it will throw down the scale, and as this collects on the sheet over the fire, there is greater danger of burning it; so that it is best to use only small quantities at first, and clean the boiler once a week until the exact effect of using the resolvent is known, after which once a month may answer every purpose.

Much has been said and written concerning the danger of putting a lighted lamp or candle into a boiler in which any of the products of petroleum have been used for preventing or removing scale, and yet the list of so-called "accidents" from this cause is growing longer and more appalling. Some of these light oils throw off gases that are very inflammable, and these collect in a boiler, so that when a light is brought into contact with them an explosion is the result. There is one sure way of preventing such catastrophes, and that is, to avoid all of that class of boiler cleansers. The best plan when such compounds are used is to open both top and bottom manholes and allow the air to circulate through until the obnoxious gases are carried off. This seems to be a very simple thing to do, yet it is not done, because some men do not read the mechanical papers, and consequently do not know what their co-laborers are doing, while others are too heedless or too forgetful to profit by what they read.

At one place where I had charge of the engine and boiler, it was customary to take the feed water from a large tank into which it was discharged from the street main. It was very convenient to put the boiler compound into this tank, and also to suppose that it was all taken up and delivered to the boilers; but after several months this tank was cleaned out, and a quantity of solid material found in the bottom of it which proved to be one of the ingredients of the compound. I am not sure that any harm was done by the practice, but it certainly did not give the compound a fair chance. This shows that it is better to use a small tank for this purpose, and after the compound is dissolved in it, shut off the water supply until the tank is nearly empty, for in this way it may be known that all of the ingredients go into the boiler.

The Triangle and the Circle.

Question and Answer No. 92 in our issue of Oct 12, was a puzzle to many of our readers, as we were quickly informed by several of them. When reproduced with the correct diagram the matter becomes intelligible. An Australian correspondent of the "Engineer," London, sent to it the diagram Fig. 1, claiming that the area of the triangle *o a u* is equal to that of the smaller circle, having, as he said, "proved" it by cutting out each figure in drawing paper and finding their weights to be equal. In the Question and Answer referred to we offered the following computation to show that they are not equal:

Let the diameter of the circle and the side of the square be 1. Then the area of the circle will be .7584, and the area of the triangle is asserted to be the same. The diameter of the larger circle will be $\sqrt{2} = 1.4142$. The radial distance between

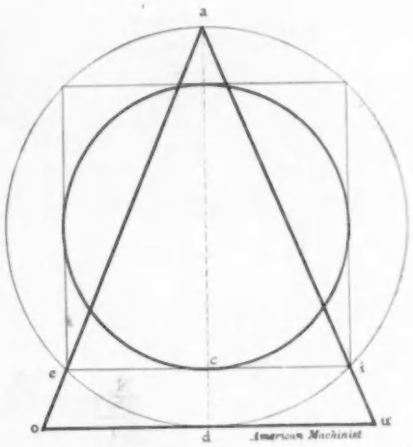


FIG. 1.

the outer and the inner circumference will then be $\frac{.4142}{2} = .2071$. The length of *a c* will be $1 + .2071 = 1.2071$, and the length of *a d* will be 1.4142. The length of *o u* will be *a c* : *a d* :: *e i* : *o u*, or 1.2071 : 1.4142 :: 1 : 1.1715 +. The area of the triangle will then be $\frac{a\,d \times o\,u}{2}$, or $1.4142 \times 1.1715 \div 2 = .8283$, or more than 5 per cent. greater than the area of the circle.

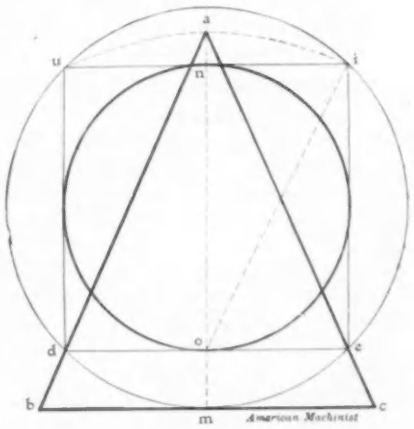


FIG. 2.

Fig. 2, submitted by a member of our editorial staff, shows a much closer approximation of the area of a triangle to that of a circle than that given above.

Having the first circle the square and the circumscribing circle, draw the arc *u i* with the radius *o i*, then from *a* as the apex, draw the triangle *a b c*, and the area of this triangle will be only about one-hundredth of one per cent. less than the area of the circle.

The diameter of the circle and the side

of the square being 1, the length of $o\ i$, and therefore of $a\ o$, will be $\sqrt{(i\ e)^2 + (o\ e)^2}$, or $\sqrt{1 + .25} = 1.118$. The length $o\ m$, as computed for the former case, being .2071, the total length of $a\ m$ is 1.118 + .2071 = 1.3251. The length of $d\ e$ being 1, the length of $b\ c$ will be $a\ o$: $a\ m$ :: 1 : x, or 1.118 : 1,3251 :: 1 : 1.1852. The area of the triangle, then, will be $\frac{a\ m \times b\ c}{2}$, or 1.3251 × 1.1852 ÷ 2 = .7853.

The misunderstanding arose from the fact that the wrong one of two very similar diagrams was inserted.

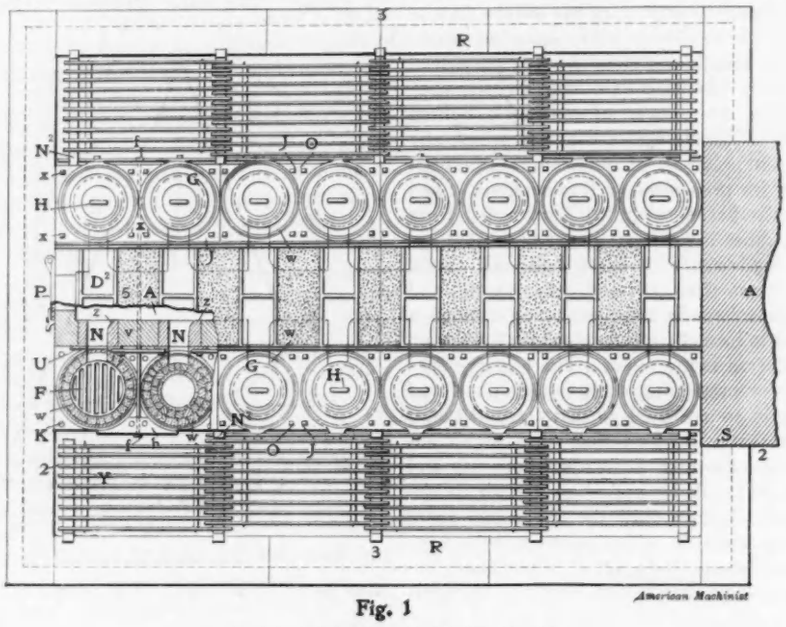


Fig. 1

PLAN OF BRASS MELTING FURNACES.

The Construction of Brass Melting Furnaces.

At the Pittsburgh meeting of the American Foundrymen's Association a paper with the above title was read by E. Millett, of Springfield, Mass. The description is as follows:

Fig. 1 is a plan of the arrangement, showing a double row of furnaces, sixteen in number. Between each pair of furnaces is seen the iron scrap box, with partition in the middle, and gratings over the ashpits at each side. At the lower left-hand corner are two furnaces shown in section. Here may be seen the individual flues *N*, connecting the furnaces with the main flue, which runs along under the scrap boxes to the stack, a section of which is shown at the extreme right.

Fig. 2 shows a single row of furnaces, the arrangement of the transverse and longitudinal I-beams, drop gates, etc.

Fig. 3 is a section through line 3—3, Fig. 2, looking from the end of the structure opposite the chimney. Here is plainly shown the grating *Y*, over the ashpits, the iron top of furnace, extending up to the inner side against the brickwork of the main flue, and supporting the iron top which holds and protects the brickwork, and upon which the iron scrap boxes set.

Fig. 4 is a vertical sectional view of the central portion of the structure through one of the furnaces, the pit wall at one side, and the grating extending between the furnace and wall, the main flue being shown at the right.

Fig. 5 is a perspective view illustrating the details of the construction of the furnace supporting devices, the upper and lower furnace-plates, and cylinder casings and uniting devices serving to simultaneously bind the furnaces on the opposite sides of the superstructure to the latter. To adjust these parts in position the casings are set down on the lower base plate, and the top plate is then set down on the casings, the long upright bolts extending through the holes, as shown, when the whole is firmly screwed together.

Fig. 6 is a perspective view of one complete top frame and part of a second one, which covers the top and incloses a portion of the side walls of the brick superstructure which forms the main flue, and also the individual flues, as shown in Fig. 4.

Fig. 7 is a perspective view of one of the metal-holding boxes, which are supported on the top frame, Fig. 6.

The construction embodies several furnaces arranged on opposite sides of a main flue running longitudinally between them. These furnaces are supported upon a substructure or base, which is practically indestructible, for it consists of masonry and I-beams, running lengthwise within and on the base. The main furnace flue, which connects with the chimney, runs along over the top of the base between the lines of furnaces, and a suitable flue connects each furnace with the main flue. The top set of I-beams, running crosswise on the base, project out beyond the sides of said base. Resting on these beams are the furnaces, which are bolted through the top and bottom plates to the beams. Therefore, no use that the furnaces themselves may be subjected to can vary the proper condition of the base as to supporting the furnaces perfectly in place. The furnaces are also united by connecting straps, front and back. Each furnace is provided with a grate hung and supported in the usual way. The pits are covered with iron grating, and this, with the absence of brick piers, assures an equal distribution of draft. It also enables the

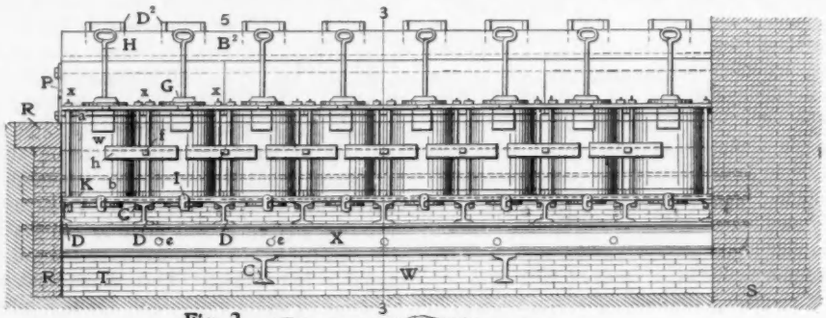


Fig. 2

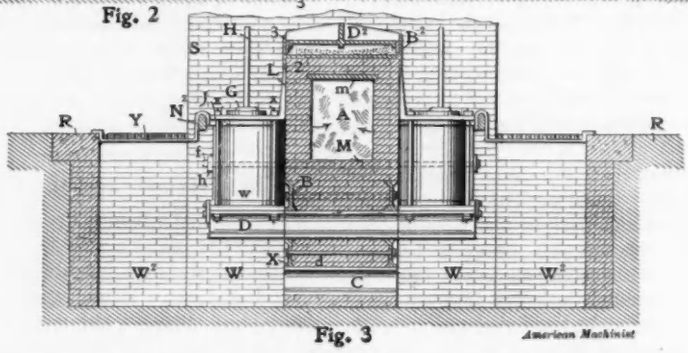


Fig. 3

ELEVATION AND CROSS SECTION OF BRASS MELTING FURNACES.

melter to instantly detect any leakage of metal from the pots.

The main flue is carried up somewhat above the top of the furnaces, and is well covered with iron plates and masonry. On this is placed a cast-iron box opposite each

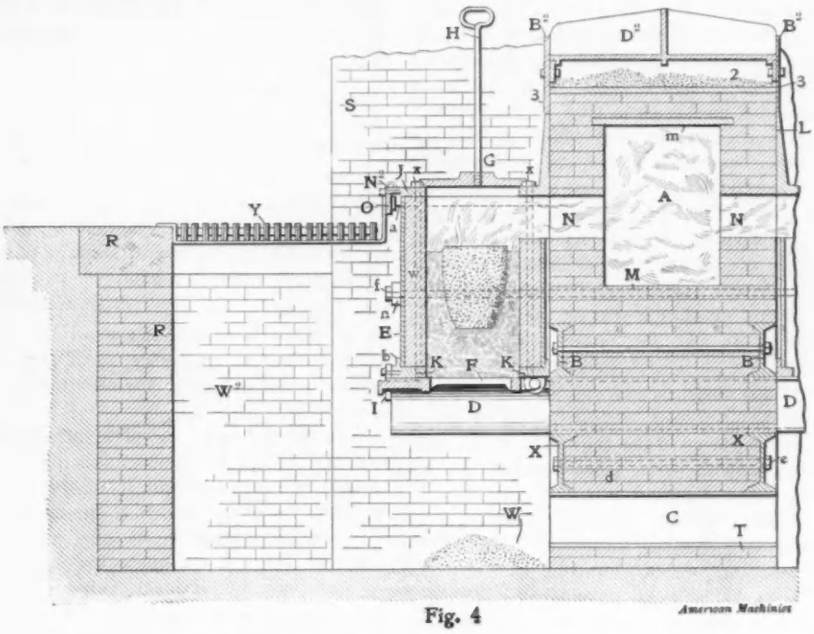


Fig. 4

VERTICAL SECTION OF BRASS MELTING FURNACES.

furnace for holding metal to be used in the furnace.

This last arrangement provides for the laying of the metal into proper charges for each crucible, and placing them in each

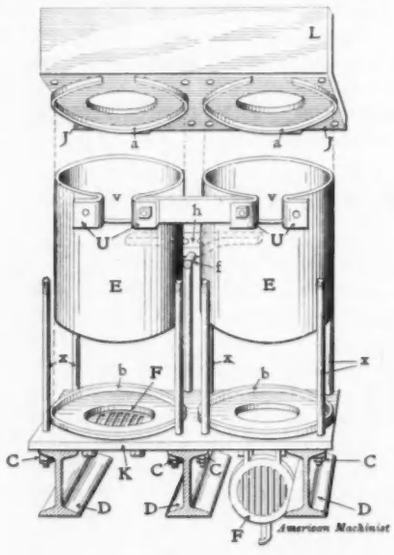


Fig. 5

PERSPECTIVE VIEW, SHOWING DETAILS OF BRASS MELTING FURNACES.

box. By doing this greater care can be exercised in the mixture of metal for each crucible than is possible when the metals are strewn around the floor of the foundry, as is generally done.

The provision of a comparatively large main flue, which answers for all the furnaces, and which gives a comparatively uniform draft, insures a uniform speed, so to speak, for melting the metal in all the pots.

A plant comprising eighteen furnaces, arranged on the above plan, has been in constant use in the foundry of the E. Stebbins Manufacturing Company, Springfield, Mass., for about a year, and it has there been proven that the melting of metals is much greater, and thereby more economical, by this construction of furnaces than by furnaces ordinarily used.

In the discussion which followed the reading of the paper, Mr. Walker said, in part: "The paper states that letters patent have been granted. Now, we look around a little and see how other people do things, and have almost this same thing in our foundry, but we support the furnaces differently. Instead of using I-beams underneath, our furnace is hung from the beams above, which I think is more simple. The manner of supporting a furnace seems hardly important enough to patent, because other good ways could be found to do that, other than the way mentioned in the paper. We have an ashpan hung close under the furnace to receive the ashes, instead of allowing them to fall to the floor, and thus can avoid a good deal of dirt and dust. When the pan becomes full two men carry it away and dump the ashes in a car near by."

The "Ironmonger" refers sadly to the fact that "armor plate for our [*i. e.*, British] warships is being planed on American lathes." Its sadness is not, we take it, caused by the fact that American lathes are so atrociously used for a job they were never intended for, but because the plates are not "planed" on English lathes instead.

Letters from Practical Men

The Libeled British Workman.

Editor American Machinist:

The letter of the "British Worker" whom I have stirred up has been brought to my notice. I am much pleased to make the acquaintance of such as he, and I hope, as also the readers in general of the "American Machinist" must hope, that he will let us hear from him again. I respect and admire him for trying to say, and for saying so pointedly and well what may be said in defense of the British workman. I frankly, and entirely without malice, gave my impression of the state of affairs, and I believe that there are many others in the United States who have the same impression with myself. As to what has promoted that impression I indicated slightly in the quotation which I gave from "Engineering." That certainly said rather more and worse than I said. "Certain classes of British workmen are less efficient the more they are paid." "In too many cases where a workman makes very high wages, his wife and family are, if anything, the worse off for it." This we have on the highest British authority, and yet our friend has nothing to say about it. In "Engineering," September 15, I find it quoting from the report of the secretary of the File Cutters' Society like this:

"After careful study of the subject, I am fully confirmed in my opinion that a great deal of the ill-health of file cutters (by hand) is the result of their neglect of the most ordinary sanitary precautions and the lack of personal cleanliness, and the wearing of clothing until it becomes satu-

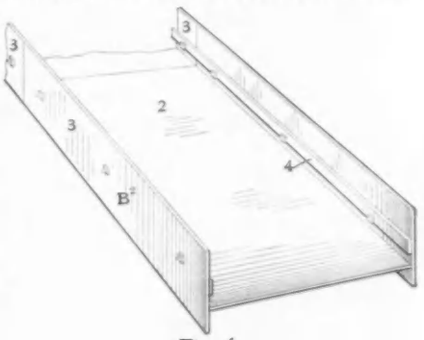


Fig. 6

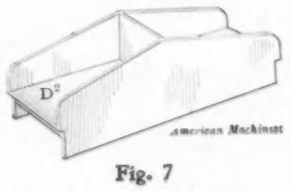


Fig. 7

TOP FRAME AND METAL HOLDING BOX.

rated with grease and lead dust. An apron is never worn, and in many cases the same garments are used for extra bed covering, and in some cases worn every day, Sunday included. I desire it to be clearly understood that the men referred to are a class of men who form the substratum,

and who seldom, if ever, are found at respectable firms, largely in consequence of their habits. So far as the general body are concerned, in my opinion the strict enforcement of the provisions of the Act is ample in providing facilities for washing of hands before meals and securing ample air space and limewashing of workshops. In many shops due regard is not paid to the cleansing of the floors, which in some cases are not paved. Some better system might be introduced with advantage which would lend itself to greater cleanliness in the shops. As regards the personal cleanliness referred to, I confess I despair of ever accomplishing anything of a permanent character with men who wilfully waste their time in dissipation, and consequently have neither the disposition nor means to properly care for themselves."

And the editor of "Engineering" remarks: "This needs no comment, and we fear it applies to many other cases where the absence of cleanliness is a source of danger. 'You may take a horse to the water, but you cannot make him drink.'"

There is more evidence of the same sort that comes to us from the other side. We have heard of a prolonged and extensive strike, the most prominent motive of which seems to have been the preventing of workmen from doing more than a certain amount of work each, although there does not seem to have been the slightest suggestion that any man was in danger of over exerting himself. I tried to intimate, and that was the point of my letter, that men in that attitude are not the ones to get the most out of our modern tools, whether automatic or not.

I have met and worked with many men of British birth and education in American shops, and they have been usually good workers and good shopmates. I dug up the recollection of one good workman who was otherwise most contemptible, and I used it simply to corroborate the British statement of the existence of such a class. If that class is a small one and very exceptional, we will welcome the evidence of it.

MORRIS FULTON.

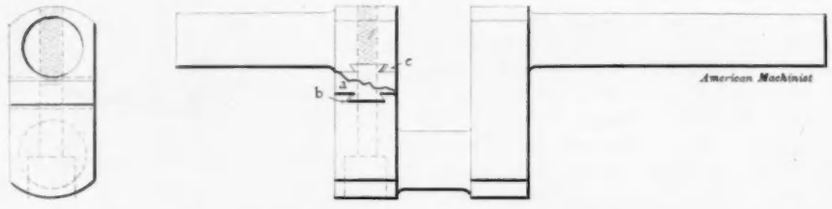
About That Broken Crank Shaft.

Editor American Machinist:

Repair jobs on machinery that are performed under peculiar or difficult circumstances, and which prove successful, are always interesting to the machinist, and for this reason I was attracted by Mr. Brown's description, in the "American Machinist" for September 28, of the broken crank-shaft job. When a machinist tackles a break-down similar to the one described, and he thinks of some method of repair that does not seem exactly practicable, it greatly increases his confidence to go ahead if he can recall a similar case that was successfully handled in the proposed manner. It appears that Mr. Brown knew of a broken crank which had been repaired in the same way as the one under consideration, and which proved entirely successful, so he had no hesitation in adopting the same method in this instance. But there is one point about which we have been left entirely in the dark, and that is whether the power of the engine was transmitted through the broken part, or whether it was on the free end of the shaft. If the latter condition prevailed, it is easy to understand how such a repair could be successfully made, but if the repaired part were required to transmit the power of the engine, it would seem very difficult to fix a broken crank in this manner and get a permanent job.

I have known the crank shafts of the mountain-climbing locomotives used in the lumber regions of Pennsylvania and other States to be repaired when broken in a similar manner to the one described by shrinking a heavy wrought-iron band around the web of the crank, and thus drawing the fractured ends firmly together. While this method makes a very uncouth looking job, and is not always practicable on account of lack of room, it is very reliable when feasible.

It seems, in the instance of the broken crank referred to by Mr. Brown, that there was plenty of time to perform the repair, and also machine tools for trimming off the fractured ends. This being the case, and supposing that it was necessary to have a smooth, neat job, why would it not have been a good idea to have dove-tailed the slots cut in the broken



parts of the crank and to have made the block *a* to correspond, but with a space left on one side of the dove-tail for a key of appropriate thickness and of about one degree taper, which could have been driven solidly home after the threaded bolt had been screwed up. Each side of the block *a* would, of course, be made for these keys, which would preferably be set in the slots on opposite sides, as shown at *b* and *c*, so that whatever offsetting effect one might have would be corrected by the other. By this method the strength of the bolt would be greatly supplemented, and the ends of the keys could be left sticking out slightly beyond the face of the crank, so that in case the parts began to "work" after being some time in service, they could be driven in, and thus tightened together. I have changed the sketch as published to illustrate the idea.

Newark, N. J. F. EMERSON.

A Sample Letter.

Editor American Machinist:

Will you please publish in your next edition of the "American Machinist" the composition of Norway iron, process of manufacture, etc.; also compare the prices of wrought iron to that of Bessemer steel. Trusting a reply, I remain

A SUBSCRIBER.

The above is typical of a good many letters received at this office, most of which cannot possibly receive any attention whatever by us.

We do not have complete information on tap ready for publication on every imaginable subject, and it would be impossible for us to publish in our next issue any such information as our subscriber asks us for. If we knew his name and address we should write and explain to him why we were unable to do it, and perhaps refer him to other sources of information; but not knowing his name, we are unable to do anything with his letter, except to make use of it in this way, as a warning to others not to waste their time and postage in writing to us on any subject whatever unless they are ready to sign their full names and addresses to their communications; because our rule in regard to these matters is the same as that of all other publishing houses—that is to say, anonymous communications go direct and with all possible speed to the waste basket.

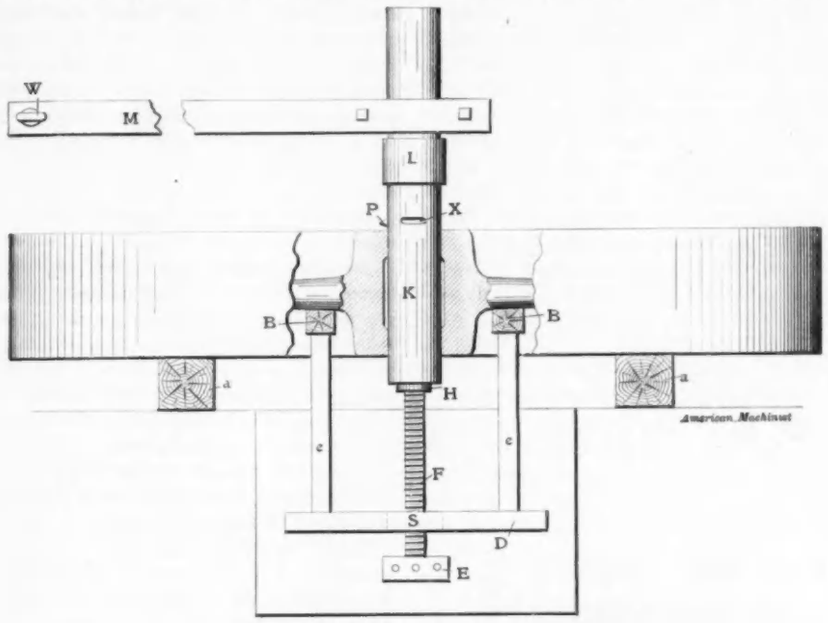
Reboring a Fly-Wheel Under Difficulties.

Editor American Machinist:

A mistake will edge itself into a job sometimes, even though a great deal of care has been taken all the way through. In the case that I have in mind, the engine was built in one place and the flywheel in another, which is a fairly reasonable excuse for the wheel not fitting the shaft when the two came together to be set up in the factory of the purchaser. We tried them together before we were ready to key up finally, and to our horror we made the discovery. If we had been in the shop it would have been a very easy matter to have put the wheel in the mill and rebore it to size. But here we were, hundreds of miles from home, and nothing but a small jobbing shop to help us out.

The first thing we did was to carve out a sort of pattern for a boring bar, about 12½ inches diameter and 6 feet long, with a 4½-inch core. We did not spend much

time with sandpaper, and the varnish pot was not thought of. At one end we cast a crossbar, 3 inches wide, for a feed-screw connection; then about 30 inches from one end we cast a square bar through the core, for holding a boring tool. We had two jobs came out not far apart. There was one point settled on this job that may have bothered engineers for a long time, and that is, that we found it required one horse-power to drive a boring mill, and no getting away from it. H. S. BROWN.



REBORING A FLYWHEEL.

to ship our pattern about twenty miles to a foundry, secure a casting, and have it delivered to our shop for turning. This we did in a short time, and we were ready to rebore our wheel.

K shows our bar as finished and ready for work. *H* is a collar for holding the feed screw *F*, and inside the bar we fitted another collar, which, with *H*, formed a thrust. The feed nut was fitted into the timber *D*. The tool for boring is shown at *P*, and at *X* we cut a hole in the side of the bar to let the chips fall through. *L* is a collar turned just the size of the shaft, and used as a bearing for the bar *K*, as the cutter bored the surface away in its downward movement. *A A* are timbers that we used for chucking the wheel, not in a lathe, but flat on the ground. *B B*, *E E* and *D* comprise a frame, clamped to the arms of the wheel, for our feed gear. All of which we hung in a pit dug out large enough to allow a man to sit in and operate the feed by a pin in the holes at *E*.

Well, as soon as we had everything ready, we gave the bar a dose of oil and hitched on our engine, which consisted of a horse, held from running away by being made fast to an eye-bolt in the end of the long beam *M*. This beam was clamped to the bar just above the collar, keeping it as low down as possible, so as not to strain the parts. This rig was not much for beauty, but it did the work, and we finished the job in a reasonably short time, which was a lot better than sending the wheel back to the shop. While this was going on, we set the engine, and the

A Job of Planing.

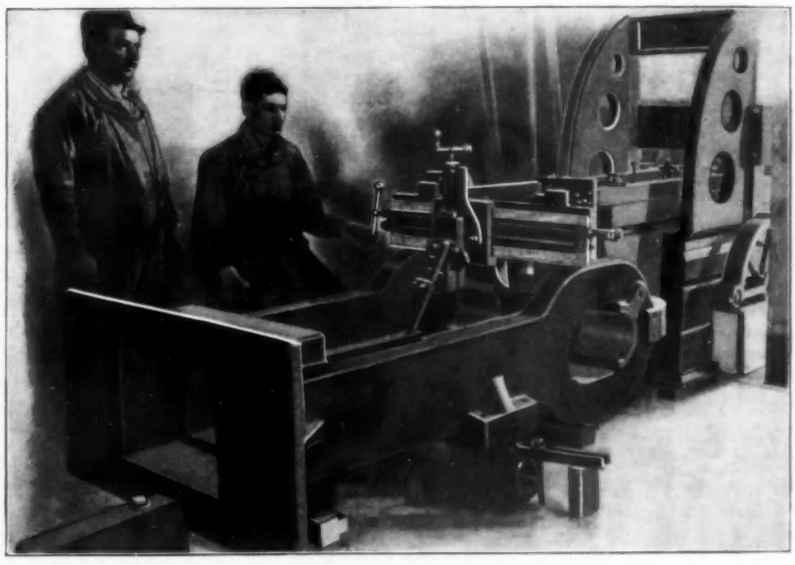
Editor American Machinist:

A few days since I had a large punching press to repair, and after taking it down and looking it over I found, among other things, that the cross-head, or ram, had cut badly on the ways, and that they would have to be planed. The ways are a part of the frame, and not bolted to it, as, in my opinion, they should be, and that necessitated handling the whole frame. As the press is 48 inches wide and my largest planer is only 42 inches between uprights, I had to devise some way of doing the job, and the photo shows how we did it.

We took two long parallels and strapped them to the platen of a 30-inch planer, so that they extended over the end about 18 inches. We then bolted two angle plates to the ends of the parallels, squared them and bolted the cross-rail of a small planer to the angle plates. We then placed the frame of the press on the floor, as far under the bed of the planer as possible, leveled and squared it by the planer and bolted it to the floor. We were then ready to go ahead with the planing, working the screws on the small cross-rail by hand, and the regular stops on the 30-inch planer for stroke. The rig turned out a very good job, and it might be of interest to others. S. A. LINTON.

Milwaukee, Wis.

[It is evident that a pretty solid floor is a necessity when work is to be done in this manner. We have seen many machine shop floors which would spring sufficiently to spoil such a job, merely by the machinist changing his position from one side to the other.—Ed.]



WHAT A PLANER CAN DO.

A Quick Cutting-Off Fixture.

Editor American Machinist:

We have here a fixture for doing on a milling machine what is usually screw-machine work, and leaving the screw machine away behind in the race at that. Suppose that we have a lot of standard studs or pins to cut off, which have to be uniform in length and square on the ends. Our screw machine, automatic or otherwise, will cut them off all right, one by one, if we give it time enough; but will it cut them to a uniform length? No, for when the stock varies a little in size, as all stock does, and comes a little small, our split chuck has to close up more, and this

causes a longer piece to be made, and *vice versa*. This trouble, however, has been obviated in some later designs of chucks. Then our tool has to be ground and set, also causing error, and unless we use two

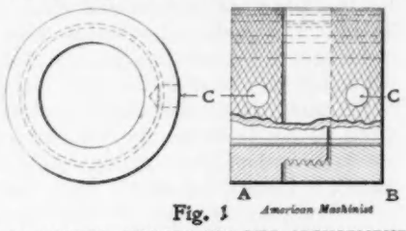


Fig. 1

MICROMETER COLLARS FOR SIDE ADJUSTMENT OF SAWS.

tools there is bound to be a little neck or burr on one end of the piece.

The arrangement here shown is a gem of its kind, and gives real satisfaction. Our cutters are put on the milling arbor and set to cut the exact length by means of the adjustable collars shown at Fig. 1.

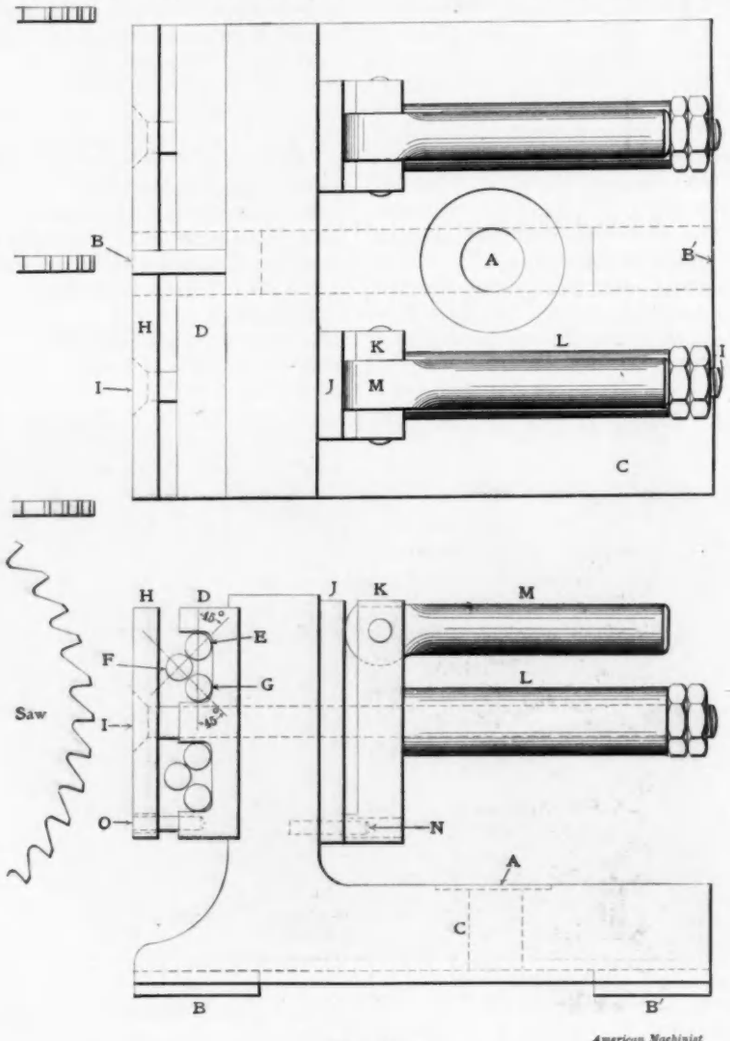


Fig. 2

MILLING MACHINE RIG FOR HOLDING RODS TO BE CUT UP.

The bushing *A* screws into the bushing *B*. Both are hardened and ground together, true as to bore and bearing faces. The adjustment is readily made by screwing them together or apart by means of the knurl, or pins inserted in the holes shown at *C*.

Our fixture, Fig. 2, is clamped to the milling machine table by means of bolts passing through the hole *A*, and is held in alignment by means of the screwed-on lugs *B*, *B'*, which fit the slot in the table. The body or angle piece *C* is machined only on the face to receive the holder *D*, and on the bottom. The holder slots are so designed that the line of centers of the touching rods *E*, *F* and *G* to be clamped and cut off shall set at an angle of 45 degrees. If smaller stock is used, five rods can be set in a slot instead of three; and if shorter pieces are required, more cutters may be used and more pieces cut at a time. Any variation in the size of the stock will be compensated for by the shape of the stock itself, and also by the clamp *H*, which is held loosely by the head of the clamping screw *I*, and is kept from turning by the pin *O*.

The holder *D* is screwed to the angle piece, and is drilled through the center to let the clamping screw *I* pass through. This screw is put through the holder, the angle piece, the piece *J* and loosely through the lever *K*, which should be rounded slightly at the fulcrum end, and the tube *L*, against which the nuts on its ends bear. These nuts give the adjustment for the proper action of the cam on the end of the cam lever *M*. The reason for leaving the tube *L* long is that it may serve as a grip for the workman to get his fingers around and aid him in bringing down the lever *M*. The pin *N* is simply to keep the levers and the piece J from turning around on *I*. *J* is used to provide a hard, smooth surface for the fulcrum end of *K* and the cam to bear against.

We raise our lever *M*, and that throws the clamp *H* back. The stock, in rods of convenient length, is inserted from the side, and the lever is then brought down, clamping them securely in place. It then takes but a short motion of the milling-machine table to cut off from six to fifty pieces (varying inversely with the size and length of stock) almost simultaneously. The stock is moved along each time enough to let the cutter nearest the spindle bearing cut off a short piece, and thus prevent any deflection of the cutter or saw.

If the job calls for a tapped hole in one or both ends of the piece, we can afterwards drill them, ten at a clip, in a jig in a multiple-spindle press. The tapping can be then quickly done in a hand screw machine or a specially arranged tapping machine.

The materials in the construction of the jig are as follows: *C* is of cast iron; *B*, *B'* and *L* of machine steel; *K* of case-hardened machine steel; *D*, *H* and *J* of hardened tool steel; *M* of tool steel hardened at the cam end, and *I* of tool steel.

H. E. HARRIS.

A Card Index for Patterns.

Editor American Machinist:

In the manufacturing establishment with which I am connected, it recently became necessary to devise some simple system of keeping track of and locating patterns. Most of the patterns in use are small, and the casting is done by different firms in and out of town, there not being a business large enough to make a foundry of our own pay. Owing to cramped quarters in the heart of the city, and a fast-growing business, only a small space is available for the storage of patterns; and yet there are about 3,000 which are continually in use and must be readily located and easily reached. Racks of varying sizes had been provided, and all patterns had been consecutively numbered and marked with large numerals, but previous to the "house cleaning," had been thrown on to the racks with little regard for order or for the fact that they might be wanted again.

The racks having been marked and the patterns placed in order upon them, so that not more than twenty or thirty patterns would be covered by a single rack mark, and gears, pulleys and pillow-blocks having, respectively, locations by them-

selves, a card index was arranged to give information in regard to them. Cards of about 2 inches by 3 inches are numbered consecutively, at the top, each number corresponding to a pattern. Just beneath the pattern number is placed a location mark, which corresponds with the location of the pattern on its rack. Most of the core boxes (all those having regular shapes) are also kept in a location by themselves, each having a separate number and a card of its own, and this fact is noted on the card belonging to its pattern. The remainder of the core boxes are kept with, and have the same number as their patterns. On each card is placed a description of the pattern, the number of core boxes and any other information regarding it deemed necessary. The cards are kept in long, narrow boxes arranged along the wall near the entrance to the pattern loft. Just beneath the boxes, and also fastened to the wall, are holders, each adapted to retain a card in a vertical position and to permit its number and description to be easily read. A certain portion of the holder is allotted to each foundry with which any business is regularly transacted, and extra space is reserved for occasional changes, and for the case when the pattern is in the shop for repairs; and whenever a pattern is sent out, its card is taken from the box and placed in the proper holder, and when the pattern is returned and inspected, its card is returned to its place.

For the case in question, where fifty or seventy-five patterns, mostly small, are away at a time, the system works admirably, and seems to be a very simple way of keeping track of them.

Indianapolis, Ind. H. F. Noyes.

The Secor Kerosene Engine.

Editor American Machinist:

In the description of the Secor kerosene oil engine, in your issue of October 5, the remark is made that "the general marine form which has been adopted is, although not cheaply produced, agreeable to the eye of those familiar with yacht and man-of-war engines." The inference seems to be intended that the marine type of design is quite as suitable for stationary use as the regular horizontal form, and that it is really only a question of whether the purchaser is willing to pay for the extra workmanship and finish.

I doubt if many builders of stationary engines could be found to subscribe to this view; and certainly the Secor engine is, as a matter of fact, in a rather small minority.

The first requirement in a marine engine is lightness; and this is so important as to justify not only the use of special materials and weight-saving construction, but also—since the engine's capacity to absorb vibration is thereby diminished—a design which throughout subordinates economy to reduction of the vibratory forces. In the stationary engine, on the other hand, the case is diametrically opposite. Here low first cost, cheap maintenance and high thermal efficiency are the prime desiderata; and hence, except for electric lighting and the like, the power is all put into one cylinder, the stroke is proportioned for economy instead of compactness, and the compression is made as high as practicable. As the vibration of such an engine is considerable, the smaller sizes have enough metal in frame or base to absorb it without the need of a substructure. If that metal is left out, whether by the use of stayed columns and marine base or in some less pretentious way, the result is simply to increase the tremor and compel a further outlay in suppressing it.

It is safe to say that all but the smallest sizes of the Secor engine should be mounted on a masonry setting, independent of the shop floor; and this alone is a serious drawback. Large numbers of gas engines are sold for small powers on the upper floors of shop buildings. Will not the Secor engine, with its light base, awkward flywheel, and vertically moving piston, be at a disadvantage here? Doubtless it can be mounted on a good sub-base (like a statuette on a beer-keg), and the cranks can be overbalanced enough to split the vibration; but the design ought to be right without patching.

The text speaks of a "6x9-inch" engine; and this proportion, which is considered about the best for economy, is a common one in stationary work. It is, of course, impracticable for boats, because every inch added to the stroke adds nearly 5 inches to the total hight of the engine; and in small launch motors the stroke is not usually more than an inch greater than the diameter. Singularly, however, the motor shown in the drawings, although not remarkably compact as to hight, has a stroke only equal to its diameter, and the extra length is all lavished on the connecting rod. I can hardly believe that this combination represents the Secor standard practice. Certainly, no stationary engine has any business with a "square" cylinder, and most decidedly nothing which sets out to look like a marine engine ought to display a connecting rod 9¼ times the crank length.

With regard to the internal action, it is only fair to add that the above anomalies may readily be pardoned if the engine will really do what is claimed for it—viz., atomize and mingle the kerosene more thoroughly by the mechanical means described than can be done with the aid of heat. The difficulty with the latter method appears to be that the vapor is imperfectly diffused. The oil is evaporated by contact with the heated surface into a true vapor or gas, which is then condensed by the cold air into a sort of heavy fog, exactly as steam is under similar circumstances; and it is not easy to regulate the evaporation so that every portion of the charge of air shall get its due quota and no more. It may very well be, therefore, that with a suitable atomizer, the less perfect comminution of the fuel is more than offset by greater evenness of distribution. So far as I know, the principle has not before been practically applied, and if the inventor has succeeded in the present instance, he deserves full credit.

Herbert L. Towle.

New Haven, Conn.

Cardboard Templets in Shop Floor Layouts.

Editor American Machinist:

In your issue of October 5 a correspondent describes a system of arranging machinery on a shop floor by the use of cardboard templets drawn or cut to the scale of the shop plan, and I note that the matter is deemed of sufficient importance to warrant brief comment on your part. Having had some experience in this class of work, I will describe an additional "wrinkle" which, while perhaps used by your correspondent, was not described by him, but one that considerably expedites the making and use of the cardboard plan models. The scheme is this:

On a sheet of ordinary cross-section paper ruled four to the inch, draw the shop-floor plan on a scale of ¼ inch to the foot, taking care to have the plan drawn "square" with the ruling. This last is easily done by making some principal line in the plan cover one of the ruled lines on the printed sheet. Each square ruled on the paper now represents a square foot of space on the shop floor. Next, on similarly ruled paper, and to the same scale, draw an outline plan of each tool or unit to be disposed of, and when so drawn paste it on cardboard and cut it out. If the paper on which the tool plans are drawn is of a tint quite distinctive from that used for the floor plan, the subsequent use of it will be made more convenient.

Now place the card plan models on the shop-floor plan, and begin the cut-and-try arrangement. The squares showing between the cards each represent a square foot, it will be remembered, so also the width of each square will represent a lineal foot, by which the width of each clearance can be instantly seen without resorting to the use of a scale for measurement. In fact, even in the making of the templets, the use of a scale is superfluous, except where measurement of the radii of circles is necessary. Counting the side of each square a foot, the plan outlines can be sketched in free hand with sufficient precision, and then cut out, using the printed ruling as a guide, and in many cases even preliminary drawing in can be dispensed with, cutting the paper at once to the required dimension by the ruled lines. The plan of the shop may be similarly drawn, using the ruling on the paper as scale dimensions.

Where the floor plan drawn to a scale

of ¼ inch to the foot would require a sheet of paper too large for convenient handling, paper with a ruling of eight, ten or more to the inch can be used, remembering of course to use paper of the same ruling for the templets. I have specified the ¼-inch scale as it is one in common use for building plans, and at the same time one which will not make the tool-plan models inconveniently small to properly label and manipulate on the floor plan. Each one should be clearly labeled.

Where large spaces are to be parcelled out, and clearances or openings are correspondingly large, and no very small tools are to be disposed of, a convenient ruling for the cross-section paper to be used is ten to the inch; the side of each square included between the heavier ruled lines thus represents ten lineal feet on the ground, and facilitates counting across large spaces. This pertains more especially to lay-outs of ground for shop buildings, storage sheds, disposition of fire apparatus, etc. A. B.

A Rocky Mountain Tool Room.

Editor American Machinist:

The proceedings of the mutual admiration society formed by my two near relatives, The Judge and Sam Better, call to mind the days of our youth, when we did several peculiar things. In a Montana jobbing shop, which seldom employed more than a dozen machinists, a good tool-room was badly needed, and I, with the help of my best people, devised the scheme which is here presented. A place was made and marked for every drill, tap, die, reamer, wrench or tool of any description to be kept in this room. No matter how cheap or simple the tool, if it was worth keeping, a place was made and marked for it. Most of these places were in wooden trays inclined about 45 degrees and with small strips separating the tools. The sizes and numbers of the tools were stamped on strips of tin ⅜ inch wide, which were nailed to the strips on the lower edges of the trays. A wire brad was driven partly into the lower strip and below each tool-space, for holding the workman's check. The trays were made and marked invariably with spaces and sizes for complete sets of the widest range that we were likely to use for years to come. Every tool was marked plainly in, as nearly as possible, the same way as its space in the tray. All tools which were not evidently members of sets were marked with consecutive numbers, no two tools in the room ever having the same number. Most of the die stocks and tap wrenches were kept on a horse, like Fig. 1, placed about the center of the room. A shallow tray of sawdust received the oil drip from the die stocks, which will occur, no matter how carefully they are wiped. Such tools as ratchet brace, breast drill, etc., which were hung on hooks or could not conveniently be placed in trays, had a paper label with the name of the tool and its consecutive number penned on it, and placed in or near the space occupied by the tool, thus showing, when a space was empty, what tool belonged there. Key drifts were kept in sets of three of each width, a short, medium and long drift being provided and marked "S.," "M." or "L." Hand taps were kept in sets of three, taper, plug and bottoming, and the space marked "T.," "P." or "B." Tit drills, flat drills, flat lathe drills, flat square shank ratchet drills, holders for lathe drills, single-end tap wrenches, "S" wrenches, monkey wrenches 14 to 24 inches in length, and a key wrench about 48 inches long, for large nuts; pipe wrenches and chain pipe wrenches, cape chisels, heavy hand and sledge hammers of various weights—all these and all other tools which could make the beginnings of useful sets had trays or places made for complete sets.

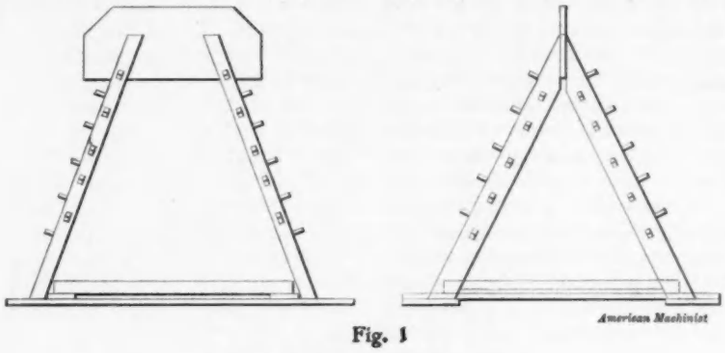


Fig. 1

RACK FOR TAP WRENCHES, ETC.

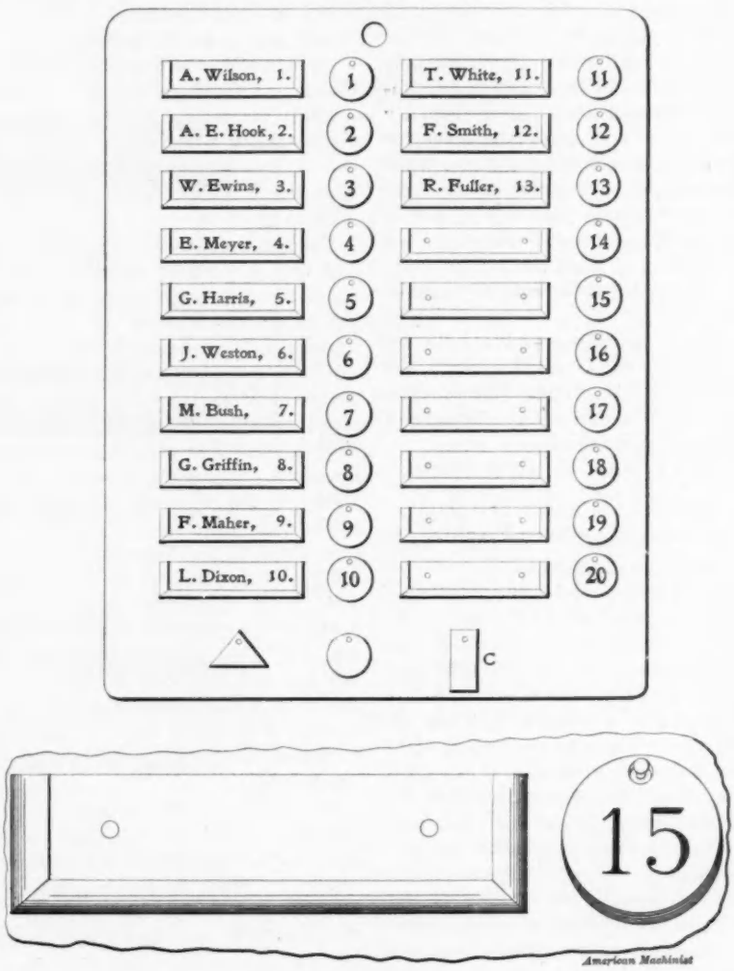


Fig. 2

THE CHECK BOARD.

In earlier days I had used a check system by which each workman was given twelve numbered checks to carry in his pocket, or otherwise care for, and present at the tool-room in exchange for tools.

Scarcely a day had passed without some workman losing one or more of his checks, sometimes insisting that the tool man had them, sometimes finding them in the wrong pocket, and often sending them to the laundry in overall pockets. So I decided to keep the checks in the tool-room. As this shop was arranged, it was not convenient to place a workman in the tool-room. This condition of things caused the adoption of the following plan, which is perhaps original in some features. A check-board was made like Fig. 2. The workman's name and number were written on a slip of stiff paper and dropped into the first unused holder on the board. The name-card holder is shown enlarged below the board, and was cut out of tin with its edges turned over and was nailed to the board. At the right of the holder was driven a wire brad at an angle sufficient to keep the checks from dropping off.

When a new man began work, his first half-hour was spent in the tool-room. His name and number having been placed on the check-board, he was instructed that no tool must be taken from the tool-room, no matter how great his hurry, without first hanging his check in place of the tool, and that the checks must be returned to the board when the tools were returned. He was then told to look the tool-room over thoroughly and learn what tools it had and how they were placed. This half-hour was time well spent, because although this was not a very large tool-room it contained more than a thousand tools, and the workmen, to use them to the best advantage, must know just what facilities were at hand. On hunting the shop over pretty thoroughly for tools, we found a condition which must occur in nearly all shops doing a wide variety of work and without any comprehensive tool system. We found many valuable tools in out-of-the-way places, unused, forgotten for years. As many as six drills of one size and none of the next, were found. Although in the aggregate there were nearly enough tools to complete many of the sets, there were so many duplicates that perhaps only half the spaces could be filled. As it was customary to lend tools to our customers occasionally (a very doubtful practice), a dozen triangular checks were hung on the check-board and these were hung in place of tools lent. I kept a small memorandum book in which all loans were itemized, dated and checked when returned. Fortunately, this book only required attention once or twice in a month. The tools needed most constantly and found missing were at once purchased or made. A dozen round blank checks were hung next to the loan checks, and when any tool was broken or lost, one of these checks was hung in its place, signifying that it must be replaced as soon as possible. As none of the sets was complete when the check system was first used, a large number of oblong checks like *C*, Fig. 2, were made, and one of them was hung in place of every tool which had not yet been made or purchased. These oblong checks were not kept on the board as shown, but were all hung at the empty spaces, and disappeared as fast as the sets filled up. It will be seen that a machinist looking for any tool would find it either in place or accounted for, provided that every man observed the checking rule. This provision was enforced by the foreman's regular weekly and frequent occasional inspection of the tool room, and admonitions to the workmen, if needed. Frequently a machinist had forgotten having used a tool until reminded that his check hung in its place. All tools not in actual use were looked up and returned to the tool-room once a week, and the rule was, to return all tools as soon as a job was finished unless needed for the next job. The mechanic looking for a tool which was not in place found either the check of the workman whose name was shown on the check-board near the tool-room door, or one of the three other kinds of checks described, and which were used only by the foreman. If the tool needed was lent or broken, or not yet made or purchased, the foreman either directed it to be at once returned, made or purchased, or else told the workman what course to take. The work of completing the sets was of course a gradual process, and the oblong checks were not out of use for several months after the check system was introduced.

In operation this scheme proved a thorough success. It required an average of not over thirty minutes each week of the foreman's time, to see that it was kept in good order—in fact, much better order than a number of tool-rooms I have seen in large shops, with constant attendance. The door of this tool-room was closed by a spring and held by an inside spring latch connected with an unobtrusive pin projecting very slightly through the floor about 18 inches in front of the door and about 3 inches to the left of the door. The uninitiated mechanic or visitor would not notice that the workman timed his steps so as to press this pin just as he took hold of the door pull. It was a frequent occurrence for meddlesome visitors or workmen from other departments not included in the check system, to approach this door with no apparent latch and after pulling ineffectually, move away with the apprentices' laugh sounding from behind a post.

S. A. Worcester.

Springfield, Ohio.

Technical Publications.

"Tables of Squares." By John L. Hall. 101 3½x5½-inch pages. The Engineering News Publishing Company. Price $2.00.

This is a new table of squares of feet, inches and fractions from zero to 100 feet by sixteenths of an inch. Decimals are carried out to the sixth place. A special feature of the book is its arrangement for quick reference. The page numbers agree with the number of feet to be squared; the squares of all fractional numbers between 45 and 46 feet, for example, being found on page 45. A separate column is given to each inch; the sixteenths of an inch being found in successive lines, with an extra space between the lines at each quarter of an inch.

"Stories of the Railroad." By John Alexander Hill. 297 5x8-inch pages; eight illustrations. Cloth, $1.50. Doubleday & McClure Company, New York.

This is a collection of stories written by a man well known to "American Machinist" readers. They were published in "McClure's Magazine" during last year and the early part of this year, and attracted a wide circle of readers, both because they introduce to literature a new phase of our modern existence, and because they are filled with living human interest. The stories touch very lightly upon the technicalities of railroading, but deal with the life of railroad men, their wives, sisters and sweethearts, in a manner that brings before the reader an exceedingly vivid mental picture along with the pleasurable emotions that accompany the reading of an interesting story.

"Small Engines and Boilers." By Egbert P. Watson. 108 5½x8-inch pages, with 33 illustrations. D. Van Nostrand Company. Price $1.25.

This book is intended for amateur mechanics, and is supposed to give complete instructions to enable them to gratify the chief object of their ambition—the construction of a small steam engine; but we are unable to see how such a mechanic is to learn how to do such work from the instructions given. There is not a single illustration of a piece in the lathe being made, and while repeated cautions regarding the necessity for accuracy abound, but few directions for securing it are given. The drawings are to no scale, are full of errors and obscurities, and some of them cannot be understood. We will defy anyone to read the eccentric drawing on page 40 or to set the valve by the instructions given, which are simply wrong. The link drawing on page 42 actually shows no travel to the valve in the mid gear! In regard to the boilers shown, we note on page 98 a vertical tubular boiler 12 inches in diameter, of the usual type, but with the upper gage cock 3½ inches *below* the water line! On page 100 is a rule for the bursting pressure of a boiler, but according to the next paragraph it gives the working pressure, which is said to be one-half the bursting pressure. In point of fact, it is one-quarter. In connection with boiler making we note the following highly important caution, which obviously needs to be made: "In drilling the holes for the tubes in the tube sheets, be careful to get exactly the same number of holes in each row of both

sheets." In general we do not believe that any amateur should be deliberately advised to play with steam of 150 pounds pressure in a home-made boiler, though we have no fear that many boilers will be made from these instructions.

"Patents and How to Make Money Out of Them." By W. B. Hutchinson and J. A. E. Criswell. 232 5x7½-inch pages. D. Van Nostrand Company. Price $1.25.

This book is chiefly a compendium of information regarding the practice of the Patent Office, the procedure in taking out patents, and such related subjects as appeals, interferences, reissues, infringements, etc. Assignments, licenses, trademarks, copyrights, caveats, foreign patents, etc., also come in for consideration. The "how to make money out of them" part of the book is small and of least importance. It occupies but forty-nine pages, which are largely devoted to explanations of the procedure in organizing stock companies. The book is honestly written and contains in condensed form a large amount of information which all who have to do with patents need. An indication of its honesty of purpose is in its treatment of foreign patents, in which the patenting of inventions abroad is discouraged. This is in refreshing contrast with the advice of so many of the publications put out by patent agencies, in which the "enormous field of operations" abroad is described and patent-

(*Continued on page 41.*)

Miscellaneous Wants.

Advertisements will be inserted under this head at 25 cents a line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Gear Wheels, gear cutting. Grant; see p. 16.

Caliper cat. free. E. G. Smith, Columbia, Pa.

Forming lathes. Mer. Mach. T. Co., Meriden, Ct.

Punches & dies. Wal. M. Wks., Waltham, Mass.

Rawhide, fibre and hard rubber gears. The Arthur Co. (See page 8.)

Construction and repair of Commutators, 50c. L. C. Sharp, Omaha, Neb.

Light and fine mach'y to order; models and elec. work specialty. E. O. Chase, Newark, N. J.

Book "Dies and Diemaking," $1, post paid. J. L. Lucas, Bridgeport, Ct. Send for index sheet.

"Brandt's Triple Expansion Gaskets" are the best for boilers. Randolph Brandt, 38 Cortlandt st., New York.

Mechanical engineer, technical graduate of '88, wants New England agency for engines, boilers, fittings or mechanical specialties. Box 352, AMERICAN MACHINIST.

Engineers and firemen, send 2 cents for 24-page pamphlet containing list of questions asked by Examining Board of Engineers. Geo. A. Zeller, bookseller, St. Louis, Mo. Mention A. M.

Institutions retiring from business having machine tools, brass and wood working machinery will find it to their interest to correspond with us. We purchase complete plants or handle them on com. C. C. Wormer Mach. Co., 55-59 Woodbridge st., W., Detroit, Mich.

Correspondence is desired with responsible and competent parties who will join the advertiser in the lease or purchase and management of large machine shop; now employing 200 men and doing profitable business; equipment nearly new. Address "High Speed," care AMERICAN MACHINIST.

A well-known mechanical engineer desires to associate with himself an energetic man with some means and of good engineering experience, for the purpose of opening an office, as mechanical and consulting engineers, also the development of valuable patented improvements on the Corliss engine. Box 353, AMERICAN MACHINIST.

Wants.

Situation and Help Advertisements only inserted under this head. Rate 25 cents a line for each insertion. About six words make a line. No advertisements under two lines accepted, and no advertisements abbreviated. The cash and copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded; but replies will not be returned. If not forwarded they will be destroyed without notice. Original letters of recommendation or other papers of value should not be inclosed to unknown correspondents.

Situations Wanted.

Wanted—To run foundry by the ton; machinery foundry preferred. Box 361, AMERICAN MACHINIST.

Foundry foreman wishes position; heavy or light castings; 12 years' experience. Box 344, AMERICAN MACHINIST.

Experienced foreman on small machines is open for engagement; best of references. Box 360, AMERICAN MACHINIST.

Jones & Lamson flat turret lathe; first-class operator open for position; best of references. Box 355, AMERICAN MACHINIST.

Party with machine shop and drafting room, general supervision of details and management of labor, desires a situation. Box 1429, Boston, Mass.

Engineer with large experience, practical and theoretical, in steamboat construction, wishes opportunity to show ability. Box 343, AMERICAN MACHINIST.

Draftsman, with shop and drawing-room experience in electric cranes, dynamos and general machinery, wants situation. Box 354, AMERICAN MACHINIST.

Situation wanted by a technical graduate, age 24, holding license as second engineer of ocean steamers; late assistant engineer U. S. Navy. Box 362, AMERICAN MACHINIST.

A Connecticut man, age 31, with 14 years' mechanical experience, would like a position as foreman or superintendent in a small factory; last 6 years spent in perfecting knitting machinery. Address Box 356, AMER. MACH.

Thoroughly capable mechanical expert desires absolute charge of mechanical work in factory employing 300 or more hands; perfect systematizer; 20 years' experience from job shop to fine interchangeable work. Box 357, AMERICAN MACHINIST.

Am American, 32, married and at present holding position as office manager in factory making general line of machinery; am good in estimating and shop cost; systematic and familiar with up-to-date practice. Can you use such a man? N. Y. or vicinity preferred. Address Box 363, AMERICAN MACHINIST.

Draftsman desires to change position; would like situation with manufacturing concern where skill as a draftsman together with a thorough knowledge of illustration work and the ability to write and illustrate catalogs and advertisements would insure a permanent situation; references A1. Address Box 358, AMERICAN MACHINIST.

Wanted—Position as chief engineer, or station leading thereto; am experienced in the operation and maintenance of engines, single and compound, and boilers; understand indicating and power measurements, and can handle the lighting plant; can satisfy with good references as to capability. Address Box 359, AMERICAN MACHINIST.

Help Wanted.

Wanted—An experienced designer on jig and tool work. Box 338, AMER. MACHINIST.

Wanted—Mechanical draftsman for gas-engine work. Box 374, AMERICAN MACHINIST.

Wanted—Man in charge hand screw machines; Boston. Address Box 371, A. MACH.

Wanted—An efficient machinist to take charge of gang in machine tool shop. Box 339, AMERICAN MACHINIST.

Wanted—Detail draftsmen and experimental hands on shoe machinery. McKay Metallic Fast. Assn., Winchester, Mass.

Wanted—Competent foreman for press-room; 15 presses on bicycle work. Address "Pedals," care AMERICAN MACHINIST.

Wanted—Good, all-round machinists on new and repair work; state age, experience and wages wanted. The Beall Machine Co., Cumberland, Md.

Mechanical draftsman wanted, familiar with general machine design and some knowledge of timber construction. Box 372, AMERICAN MACHINIST.

Wanted—Two or three good, all-around machinists for new and repair work; state age and experience fully. Address Box 365, AMERICAN MACHINIST.

Foreman wanted at once on light contract and typewriter work; wages about $4; state age, where worked and references. Address Universal Lock Co., Woodbine, N. J.

Wanted—Experienced factory superintendent; one familiar with gun work preferred. Address "Superintendent," care Star Manufacturing Company, 47 Dey st., New York.

Wanted—A live man to take charge of machine shop employing 40 men; one having some knowledge of electrical work preferred; state wages, etc. Box 364, AMER. MACH.

Wanted—Foundry foreman, experienced particularly on small work, such as valves and fittings; state age, experience and wages expected. Address Box 348, AMER. MACH.

Wanted—Draftsman on engine and boiler work; one experienced on locomotive work preferred. Address, with references and salary expected, Box 373, AMERICAN MACHINIST.

Wanted—A young man, competent and experienced in erecting, testing and adjusting high-speed automatic engines, both at shop and on the road. Buffalo Forge Company, Buffalo, N. Y.

Machinists wanted; a number of first-class men on high-speed marine engine work. Apply Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, New York City.

Wanted—Experienced draftsman to work on cotton machinery; good position for an A1 man; state experience, references and salary expected. Address Box 317, AMERICAN MACHINIST.

Wanted—In our automatic screw-machine department of 18 machines, one working sec-

How About Your Oil Bills?

Would it be worth while to cut them in two? If so, send for Catalog 16 describing the **CROSS OIL FILTER**, or, better yet, send for a Filter on 30 days' trial. Capacities, 3 to 150 gallons daily.

The Burt Mfg. Co.

AKRON, OHIO, U.S.A.

Largest manufacturers of Oil Filters in the world.

A Valuable Volume.

Everyone who is in any way interested in Mechanics will find it to their advantage to immediately procure the new book entitled,

MECHANICAL MOVEMENTS,

Powers, Devices and Appliances.

By Gardner D. Hiscox, M. E.

Over 400 pages. Large octavo. 1649 specially made illustrations, with full descriptive text.

PRICE, $3.00.

This work is practically a complete mechanical education, commencing, as it does, with a rudimentary description of the first known mechanical powers, and gradually tracing up the history of mechanics and appliances to the present day.

It fully illustrates the leading devices for the transmission of power and its measurement. It exhaustively describes every known motive power in the world, deals with the principles of construction in electrical appliances, treats of the horseless carriage and bicycle movements, minutely describes every known kind of machine, both large and small, gives their various uses and method of construction, and, in short, presents a copious dissertation on mechanics, powers, devices and appliances.

It is a book which every machinist, inventor, student, mechanic, draughtsman, engineer, electrician, and everybody interested in the devising and operation of mechanical works, should have in his possession. As a handy book of reference it is without a peer.

A special illustrated circular mailed on application, or the book prepaid to any address in the world on receipt of price.

Our 96 page catalog of practical books sent free to any address.

NORMAN W. HENLEY & CO., - Publishers,

15 Beekman Street, NEW YORK.

ond hand and one operator on the Hartford and Cleveland machines. McKay Metallic Fast. Assn., Winchester, Mass.

Wanted—In New York City, a first-class draftsman with experience in automatic machinery and machine tools. Address letters, stating age, references and salary wanted, to Box 369, AMERICAN MACHINIST.

Wanted—Expert machinist for experimental work, able to help in drafting, with experience on the Mergenthaler Linotype preferred; state experience in detail and salary expected. Box 370, AMERICAN MACHINIST.

Machinists wanted; a few good lathe, planer and milling-machine hands, for steady work; location a short distance from New York. Write, stating ability and where previously worked, to Box 368, AMER. MACH.

Wanted—One good machine blacksmith for heavy and light work under steam hammer and anvil; permanent position and good wages for suitable man; state age and experience. Address Box 366, AMER. MACHINIST.

Agents wanted for the renowned Mietz & Weiss kerosene and gas engine; this is the most successful kerosene engine made, and cheapest to operate; desirable agents wanted for every principal city. Address A. Mietz, 128 Mott st., New York City.

We are enlarging our works, and will shortly require an increased number of skilled mechanics; we invite applications from draftsmen, pattern makers, molders and machinists. Address the Westinghouse Machine Company, East Pittsburgh, Pa.

Wanted—First-class foreman for machine shop, building steam engines and a general line of repairs; in applying state age and experience fully and salary expected, and how soon you could come if employment was given. Address Box 367, AMER. MACHINIST.

Wanted—Superintendent, capable and energetic man, thoroughly experienced in factory practice; knowledge of the principles of electricity desirable, but not essential. Address "Manufacturer," care AMERICAN MACHINIST, stating experience, age, references and salary expected.

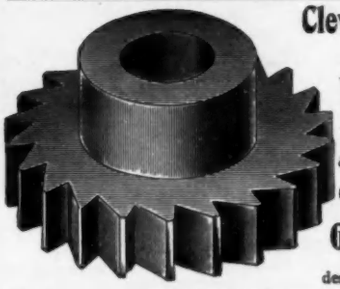
Wanted—Draftsman with thorough mechanical education and experience, ingenious, energetic and modern; familiar with office work as well as shop management; must understand pattern making and molding, and used to handling men; for large textile manufacturing concern. Address Drawer No. 2030, Paterson, N. J.

Wanted—In big city in England, works foreman or superintendent experienced in gas-engine work; splendid opening for good, energetic, experienced man; must be able to originate a system of gages, jigs and special tools and efficiently control about 80 hands; salary £3 10s. per week and commission. Address Box 346, AMERICAN MACHINIST.

Wanted—For a large textile machine-making concern employing over 2,000 hands, a thoroughly practical general works manager, competent to control all departments, viz., drawing office, pattern making, iron and brass foundries, work shops, etc; good opening for an energetic, experienced man; age about 35 preferred. Application, stating experience, to be made by letter only, in first instance, to Alfred Tongue & Co., 86 King st., Manchester, England.

HINDLEY WORM GEARING.
MORSE, WILLIAMS & CO.,
PHILADELPHIA, PA.

MACHINERY
WIRE MILLS & CHAIN FACTORIES
WRITE FOR CATALOG AND PRICES.
The Turner, Vaughn & Taylor Co.,
Cuyahoga Falls, Ohio, U.S.A.



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W. R. SAWYER, Lessee.
86 Seneca St., Cleveland, Ohio.
GEARS of all descriptions.

If You're Stuck
in the development of that new machine and want some thorough, intelligent experimental work done, perhaps we can help you. Tell us your troubles.
Grant Mfg. Co., Bridgeport, Ct.

NEW HAVEN MFG. CO.
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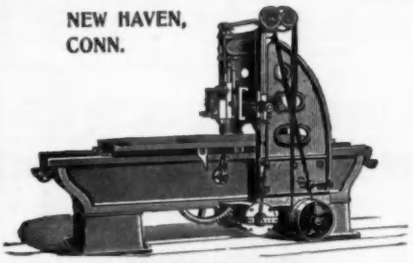

MANUFACTURERS OF
IRON WORKING MACHINERY.

FOR SALE—Van Norman Lathe, 28", Waltham Watch Tool Co.'s make, with full attachments, nearly new, will sell at a bargain.
GEO. H. WARREN, Assignee,
S. C. FORSAITH MACHINE CO., Manchester, N.H.

PATENTS secured in the United States and foreign countries. Investigations as to novelty and validity. Litigation conducted in the Courts and Patent Office. Members of the bar of the United States Supreme Court and various Circuit Courts.
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25 Grant Pl., Washington, D. C. 141 Broadway, New York.

BULLOCK MOTORS. SEND FOR BULLETIN 0232 & 0235 BULLOCK ELECTRIC MFG. CO., CINCINNATI, O., U. S. A.

This Picture Shows the Die That's Used

in the "Green River" Screw Plates—shows a Die and Guide taken apart to show how they're made and put together. The cup-headed screw on the right holds the halves firmly together, acting as a hinge, while the size is regulated by the wedge-shaped (taper head) screw on the left, the whole being clamped in the elastic stock. This Die is adjusted for wear, and to make bolts or nuts fit tightly or loosely, as desired. For cutting close up to a shoulder the face side of the Die is used after starting the thread with the other side.

Send for our 204-page catalog of patent screw-cutting and other labor-saving machinery and tools.

WILEY & RUSSELL MFG. CO., Greenfield, Mass.

Selig, Sonnenthal & Co., 85 Queen Victoria St., London, Eng.

(*Continued from page 40.*)

ing abroad is urged—the real reason for the advice being, of course, the desire to earn the fees that go with the case. We cannot but think that the title is misleading, as its tendency is to lead inventors to buy the book under the impression that they will find it a source of information regarding the successful marketing of their inventions. The real scope of the book and nature of its information are pointed out above.

Inquiry for Machinery.

(110) Machinery used in the making of hardwood pocket rules.

Personal.

Mr. H. E. Tiemann has been appointed an instructor in mechanical engineering at the University of Pennsylvania.

Henry F. Kellemen, recently with the Pratt & Whitney Company, Hartford, has accepted the position of chief draftsman for the Blake & Johnson Company, Waterbury, Conn.

Mr. Wm. S. Accles, manager of the English branch of the Niles Tool Works Company, with headquarters in London, sailed for this country on the 21st inst. per steamship "St. Louis."

We would be pleased to receive the present address of Mr. John Scheider, formerly of Washington, Pa., and whose core-box for globe valves was illustrated and described in our issue of September 26, 1895.

Mr. R. J. Russell, formerly chief engineer and master mechanic for the New Jersey Electric Railway Company, has recently accepted the position of foreman machinist in the shop of the Maryland Steel Company at Sparrow's Point, Md.

Our contributor, R. I. Clegg, has assumed editorial charge of the mechanical department of our contemporary, "The Horseless Age," of New York city; but, we understand, will retain his position with the Cross Pen Company, of Providence, R. I.

Mr. Alfred Muir, of Manchester, England, accompanied by Mrs. Muir, arrived in New York on the 11th, per steamship "Oceanic." While here Mr. Muir placed an order with at least one machine tool builder. They sailed for Liverpool again on the 18th inst. on the same steamer.

Mr. Henry T. Kimman, mechanical superintendent of the Standard Pneumatic Tool Company, of Chicago, sailed for England on the 21st inst. He is to superintend the installation of machinery in the works of the International Pneumatic Tool Company, Chippenham, England, which company recently purchased the right to manufacture and sell in the British Empire pneumatic tools controlled by the American concern. Mr. Kimman will be absent about three months.

Obituary.

Mr. Lucian Sharpe, head of the Brown & Sharpe Manufacturing Company, who for some time past has been in ill health, died October 17 on the steamship "Saale" while on his way home. Mr. Sharpe was in a critical condition when he undertook the homeward voyage, but it was hoped he would survive until its end. Some account of Mr. Sharpe's career will be published in an early issue.

Joseph Wood, the oldest locomotive engineer in the United States, died at Red Bank, N. J., October 17, eighty-nine years old. He had fired on the "John Bull," the first locomotive used in this country. It was brought over from England in 1830, and had its first trial at Bordentown, N. J., where Mr. Wood was born. He was employed as a government railroad engineer during the civil war. He invented an improved frog and other railroad appliances.

The subject of an exhibition to take place in Russia in 1901, and to be held either in St. Petersburg or Moscow, is being discussed, and exhibitors of machinery at Paris are being asked to take some action regarding the proposed Russian exhibition. It has been ascertained that the Russian Government will look very favorably upon such an exhibition and will afford every practicable assistance toward the holding of it. and it is believed that it would pay exhibitors in many cases to send their machinery and appliances from Paris to St. Petersburg or Moscow for exhibition before bringing them home. Full information can be obtained regarding this by addressing United States Commission to Paris Exposition of 1900, Equitable Building, New York City.

Bethlehem Steel Company, South Bethlehem, Pa., is adopting a somewhat unique method of having nickel steel forgings tried on locomotives. It is offering such forgings at a reduced price for a limited time, on condition simply that a record of the performance of such forgings shall be sent to the makers at the end of their terms of service.

The only place where "black diamonds" are found is in the Brazilian province of Bahia. They are usually found in riverbeds and brought up by divers. Others are obtained by tunneling mountains. The largest specimen ever found was worth $20,000. These stones are nearly as hard as genuine diamonds, and are used as cutting tools.

Manufacturers.

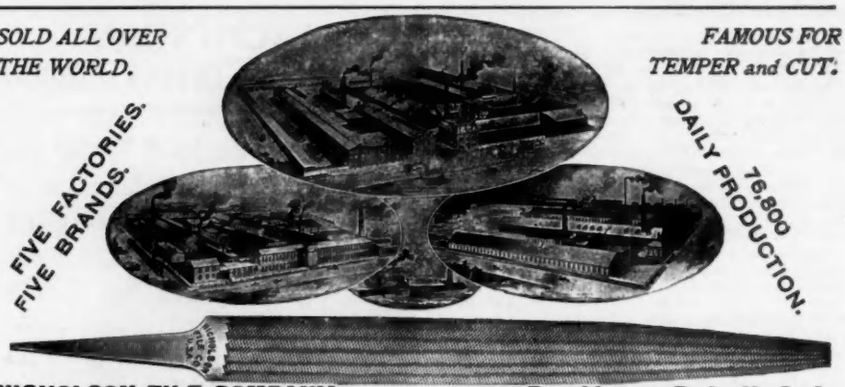
The Union Bag & Paper Company will build a new factory at Sandy Hill, N. Y., on the shore of Lake Champlain.

The Hewitt Steel Car Truck Company, recently incorporated in the State of New York,

(*Continued on page* 43.)

SOLD ALL OVER THE WORLD. *FAMOUS FOR TEMPER and CUT.*

FIVE FACTORIES. FIVE BRANDS. DAILY PRODUCTION. 76,800



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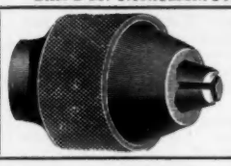
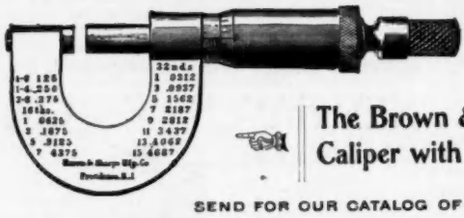


Almond Drill Chuck.
Sold at all Machinists' Supply Stores.
T. R. Almond,
83 & 85 Washington St., Brooklyn, N. Y.



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The Brown & Sharpe No. 8 Micrometer Caliper with Ratchet Attachment.

SEND FOR OUR CATALOG OF MACHINISTS' TOOLS.

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SUCCESSORS TO
THE POWELL PLANER CO.,
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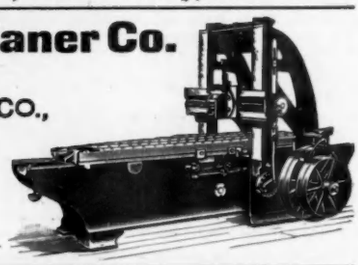

U. Baird Machinery Co., 125 Water St., Pittsburgh, Pa.
Robinson & Cary Co., St. Paul, Minn.
W. R. Colcord Mchy. Co., 502 North 2d St., St. Louis, Mo.
Parke & Lacy Co., Fremont St., San Francisco, Cal.
The Fairbanks Co., 705 Arch St., Philadelphia, Pa.

COMPARE WEIGHTS
WHEN YOU ARE TOLD THAT JENKINS' '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.
Average weight ⅛ inch "Jenkins '96," 11 lbs. to the square yard.
" " ⅛ " Red Packing, 14 " " " "
At 50c. per pound "JENKINS' 96" is not only very much cheaper, but the best joint packing manufactured.
JENKINS BROS. NEW YORK, BOSTON, PHILADELPHIA, CHICAGO.

THE STRENGTH OF MATERIALS.
A Text Book for Manual-Training Schools. By MANSFIELD MERRIMAN.
Forty Illustrations. Eleven Tables. Numerous Practical Problems.
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Published by JOHN WILEY & SONS, - 53 E. Tenth Street, New York.

GRIND UP YOUR EMERY WHEELS.
A substance that will cut emery will do your grinding and polishing faster than you are doing it now. It will do more work. It will do faster work. It will save you money.

CARBORUNDUM

will cut emery with ease. Carborundum is the hardest substance in the world excepting the diamond. It is made up in forms and grades to suit the requirements of the grinder and polisher of metal, glass, granite, pearl, wood, leather, carbon, rubber, ruby, sapphire and porcelain.

THE CARBORUNDUM CO., NIAGARA FALLS, N.Y.

RADIAL DRILLS

ALL manipulations are performed by one LEVER without stopping nor the operator leaving his place.

Save 25% of Time and Tools

Used in the best shops all over the world.

DRESES, MUELLER & CO., - Cincinnati, O., U.S.A.

NEW JERSEY MACHINE WORKS,
WILLIAM TYACK, Jr., PRESIDENT,
BUILDERS OF
ALL CLASSES OF MACHINERY
Also Builders of Steam and Gas Engines.
NEWARK, N. J., U.S.A.

Drills for Light Work.
We make drills from one to eight spindles, hand and automatic feed. Send for price of the
"W. & R. Special"
Double Head Traverse Drills; also adjustable Two Spindle Drills, Tapping Machines, Cutter Grinders, Surface Grinders, Centering Machines.
Write for Catalog.
Woodward & Rogers, Hartford, Conn., U. S. A.
European Agents: { Selig, Sonnenthal & Co., London, Eng. / E. Sonnenthal, Jr., Berlin, Germany.

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SHONBERG'S
Anti-Friction Bearing Metal.
Six qualities, all guaranteed to be as good as any metal in the market.
CORRESPONDENCE SOLICITED.
I. SHONBERG, - - - - 172 Hudson Street, New York.

BARNES'
Upright Drills ..

Complete Line, ranging from Light Friction Disk Drill to 42 in. Back Geared and Self-Feed. **This Cut** represents our 22½ in. Swing Drill. We are prepared to furnish it with or without Back Gears, with or without Self-Feed. The **Self-Feed** arrangement on this drill gives the operator the choice of five feeds.

LEVER FEED,
HAND AND WORM FEED,
POWER SELF-FEED,
AUTOMATIC STOP,
QUICK RETURN.

Send for Catalog, giving full description of all our Drills.

W. F. & John Barnes Co.,
1995 Ruby Street,
ROCKFORD, - ILL.

CHAS. CHURCHILL & CO.,
English Agents,
London, E. C.
FENWICK FRERES & CO.,
Brussels, Zurich and Paris.
GUSTAV DIECHMANN & SOHN,
Berlin.
C. S. CHRISTENSON,
Christiania.

(*Continued from page 42.*)

has bought a site at Depew, N. Y., on which it is intended to build a plant.

Architect Ringer is drawing plans for a power-house at Clinton and Oregon streets, Milwaukee, Wis., for Pawling & Harnischfeger. It will be built of brick and stone, 50x50. Cost, $6,000.

William Steele & Son, Philadelphia, Pa., have the contract for a three-story factory addition, 80.10 by 90.4 feet, to the plant of John H. Wallace & Bro., at Juniper street and Snyder avenue. The cost is $6,000.

The Western Electric Company, Chicago, Ill., has taken out a permit authorizing the construction of a two-story foundry, 50x170 feet, the cost being given at $25,000, and two and one-story additions, 48x97 and 50x156, the cost of these being given as $25,000.

The Central Brick Company, Pittsburgh, Pa., with $25,000 capital, has been organized by Pittsburghers interested in the brick business. A State charter is to be obtained November 1. A plant, owned by some of the interested, is to be rebuilt and improved machinery installed.

The Alan Wood Iron Company, of Conshohocken, Pa., has begun the erection of a large addition to its plant. The new mill will be used for the manufacture of 96-inch plate. The mill will require a complete set of special machinery, two new heating and one annealing furnace at an investment of $50,000.

The George Watkinson Rubber Manufacturing Company, at Twenty-fifth and Reed streets, Philadelphia, Pa., intends erecting a brick and iron factory addition to its works on Schuylkill avenue, near Reed street, which will be two stories and basement, measuring 155x137 feet. An extension measuring 30x90 feet will also be included.

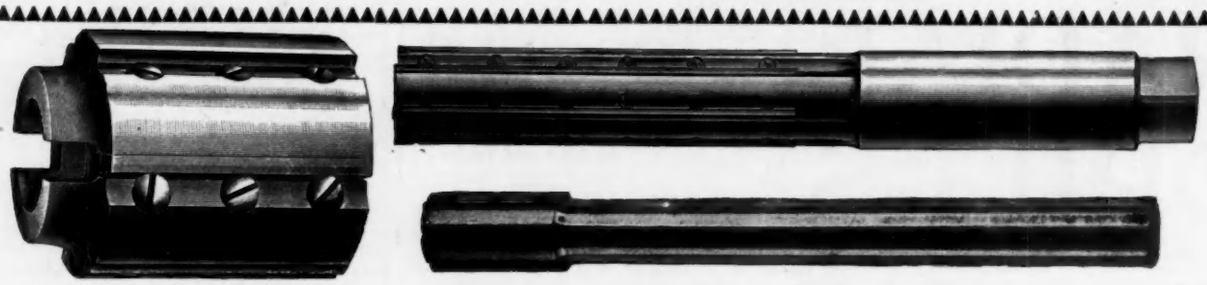
The North Pittsburgh (Pa.) & Foundry Company has been organized to succeed the Carlin Manufacturing Company, and will erect a foundry on the site of the old Allegheny plant of the Carlin Company. The foundry will be equipped for continuous process and cast-iron soil pipes. The capital will be $100,000. At a stockholders' meeting, David Carlin was elected president, and C. C. Henry, secretary and treasurer.

New Catalogs.

The Chisholm & Moore Manufacturing Company, Cleveland, O., sends us catalog of pneumatic and hand-power chain hoists, cranes and trolleys, pneumatic riveting machines, etc. Sectional views of the different parts of these hoists are given, enabling one to understand the method of operation. The catalog is standard size, 6x9 inches.

Robt. Wetherill & Co., of Chester, Pa., send us catalog in which are illustrated and described Corliss engines as built by them. Full details of the various parts of these engines are given, and many illustrations are included, assisting materially to the clearer conception of the functions of these parts. The catalog is standard size 6x9 inches.

Brown & Sharpe Manufacturing Company, Providence, R. I., has recently sent out a new catalog and price list of machinists' tools, including rules, calipers, gages, squares, etc., etc. Each of the tools is described quite fully and their particular uses pointed out. The catalog contains a number of useful tables and also hints on the manipulation of micrometers, verniers, etc., which ought to make the catalog of interest to those who have to do with such tools. The catalog contains 127 pages, and is standard size, 6x9 inches.



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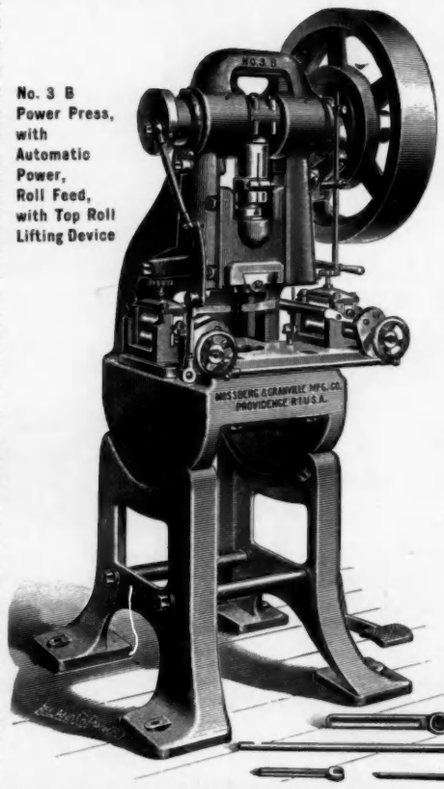

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